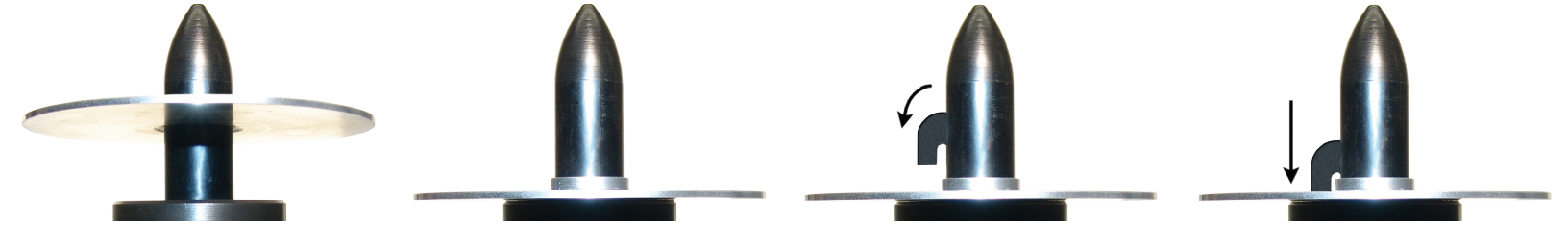
User Guide: Pin Locator Clamps

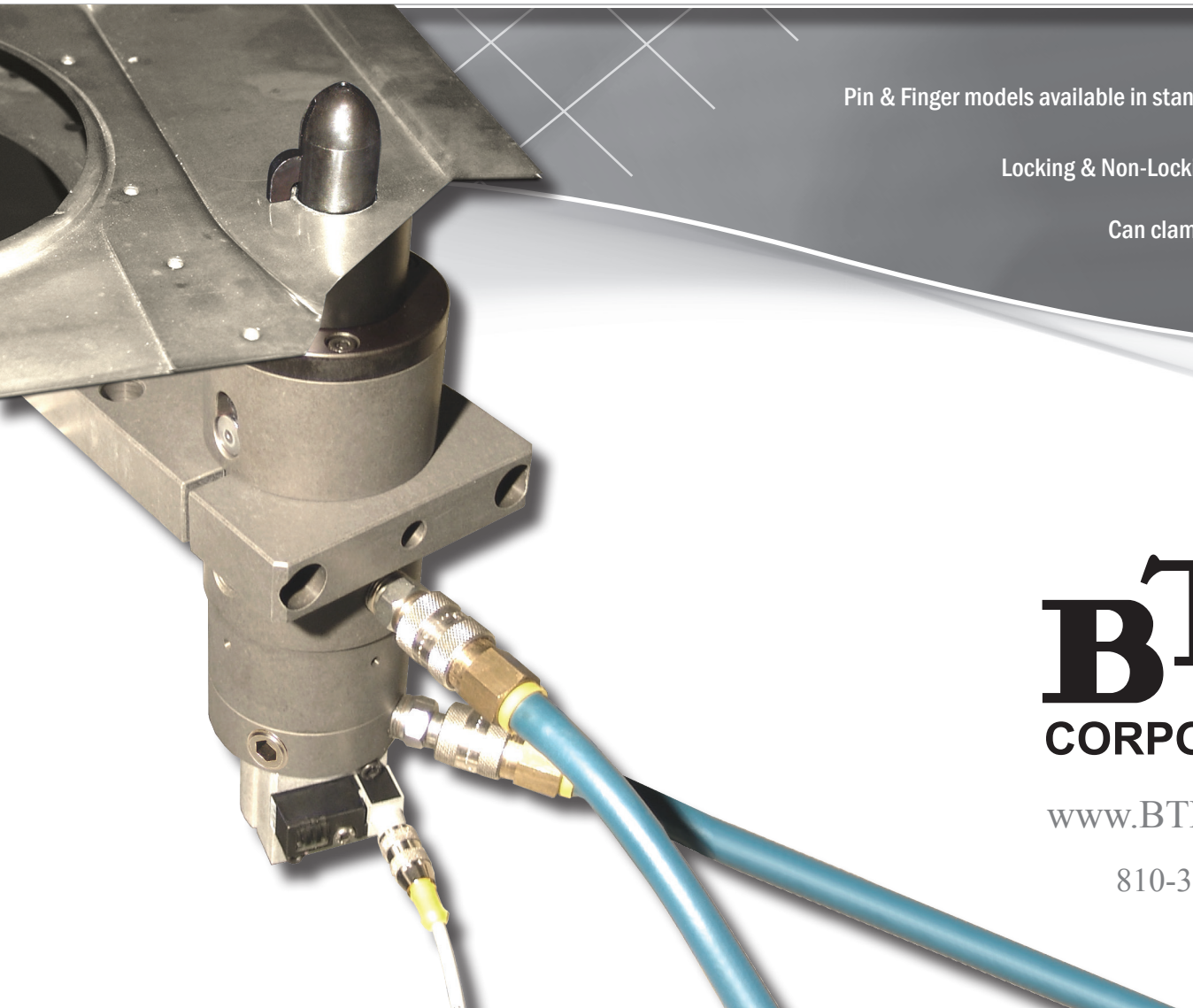
Featuring information on all standard Pin & Finger Locator Clamp models.



Pin & Finger models available in standard or special sizes

Locking & Non-Locking models available

Can clamp over flanged holes



BTM® CORPORATION

www.BTMcorp.com

810-364-4567

***Safety Note** - Customer is responsible for the safe operation and use of the products shown in this literature.*

Before You Begin

BTMs' Pin and Finger Clamps are designed to provide long service in a production environment. For safe operation and best results read this guide thoroughly before installing or servicing BTM clamps.

For clamp application questions contact BTM's sales department at 810-364-4567.
For service issues call our service pager at 810-340-3039 to leave a numeric message; we will return your call promptly.

Non-Locking Clamps

PLC-45
PIN LOCATOR CLAMP

Hole/Slot Range	12.80mm-16.00mm
Clamping Force	578N @ 5.5BAR (130lbf @ 80PSI)

Features

- Hardened pin Rc 58-62
- Pin diameter range: 12.8mm-16.00mm Ø
- Clamps on top of a flange.
- 360° mounting surface.
- 90° positive locating detents
- World switch package

PLC-63
PIN LOCATOR CLAMP

Hole/Slot Range	19.80mm-40.00mm
Clamping Force	1334N @ 5.5BAR (300lbf @ 80PSI)

Features

- Hardened pin Rc 58-62
- Pin diameter range: 19.8mm-40.00mm Ø
- Finger relief for flanged hole clearance (25mm, 30mm, 40mm)
- 360° mounting surface
- 90° positive locating detents
- World switch package

SFC-63
SINGLE FINGER CLAMP

Hole/Slot Range	18mm-40mm
Clamping Force	1334N @ 5.5BAR (300lbf @ 80PSI)

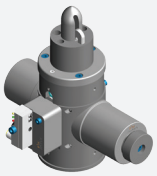
Features

- Hole or slot range: 18mm-40mm Ø
- Finger relief for flanged hole clearance
- 360° mounting surface.
- 90° positive locating detents
- World switch package

Locking Clamps

LPLC-38
PIN LOCATOR CLAMP

Hole/Slot Range	19.80mm-40.00mm
Clamping Force	900 - 1334N @ 5.5BAR (200 - 300lbf @ 80PSI)

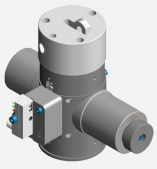


Features

- Hardened pin Rc 58-62
- Pin diameter range: 18mm-40mm Ø
- Finger relief for flanged hole clearance (25mm, 30mm, 40mm)
- 360° mounting surface.
- 90° positive locating detents
- World switch package (front or rear pos.)

LSFC-38
SINGLE FINGER CLAMP

Hole/Slot Range	18mm-40mm
Clamping Force	900 - 1334N @ 5.5BAR (200 - 300lbf @ 80PSI)



Features

- Hole or slot range: 18mm-40mm Ø
- Finger relief for flanged hole clearance
- 360° mounting surface.
- 90° positive locating detents
- World switch package (front or rear pos.)

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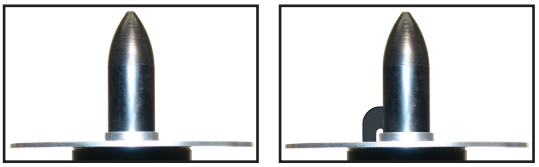
WARNING! *- Always discronnect air and electrical supply lines before working on or around clamps.*

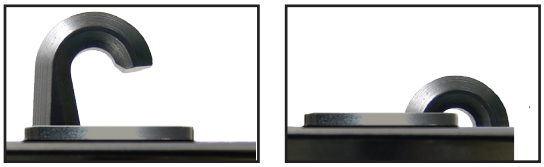
CLAMP SELECTION

Hole size determines pin clamp model. In addition to hole size, other factors must be considered, such as:

MUST THE PART BE LOCATED AND CLAMPED OR JUST CLAMPED?



LOCATED AND CLAMPED: **Pin Locating Clamp (PLC)**



CLAMPED: **Single Finger Clamp (SFC)**

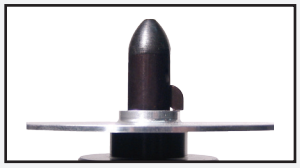
MUST THE PART REMAIN CLAMPED WHEN THE AIR SUPPLY IS REMOVED?

Select a **Locking Pin Locating Clamp (LPLC)** or **Locking Single Finger Clamp (LSFC)**

In cases involving an extruded (flanged) hole:

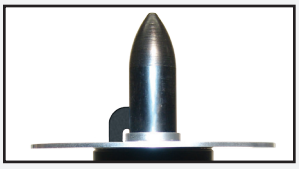
12-18mm	=	PLC45

Note: PLC45: finger will clamp on top of hole flange (non-locking)



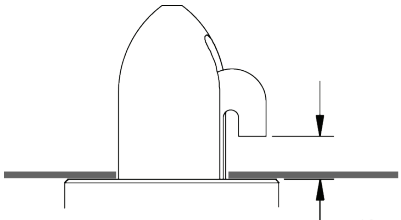
18-40mm	=	PLC63 LPLC38

Note: PLC63: finger will clamp over hole flange (non-locking)
LPLC38: finger will clamp over hole flange and lock

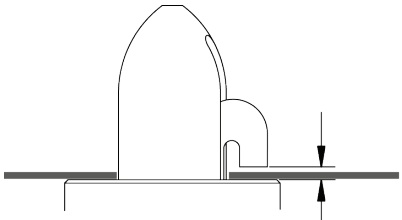


CONSIDER THE MATERIAL THICKNESS VARIATION RELATIVE TO THE SPECIFIED CLAMPING AND LOCKING RANGE FOR EACH SIZE/TYPE OF PIN CLAMP:

12-18mm = PLC45	Clamping range = 10mm from top of rest block (donut)
18-40mm = PLC63	Clamping range = 10mm from top of rest block (donut)
18-40mm = LPLC38	Clamping range = 3mm from top of rest block (donut)



10 mm Clamping Range to rest block surface *(allow for material)*

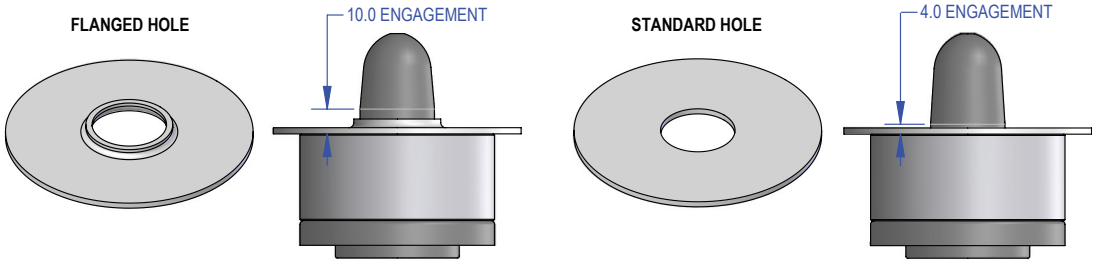


3 mm Clamping/Locking Range *(allow for material)*

Now that the type of clamp has been selected consider the pin and rest block (donut) requirements:

Try to select a standard pin configuration to keep the cost down.
However, when special pins and rest blocks (donuts) are required please consider the following:

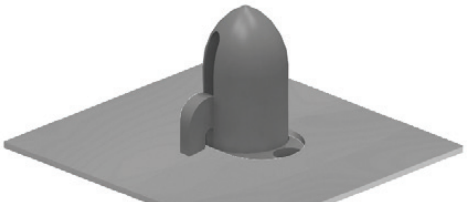
IS THE HOLE FLANGED* OR STANDARD?



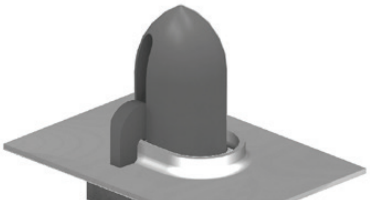
* Flanged pin option *only* available on 25-24.8, 30-29.8, and 40-39.8mm sizes

DESIGN STEPS

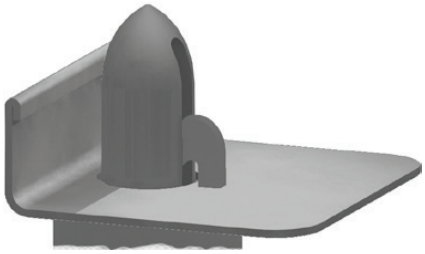
Turn the clamp to locate the finger to:



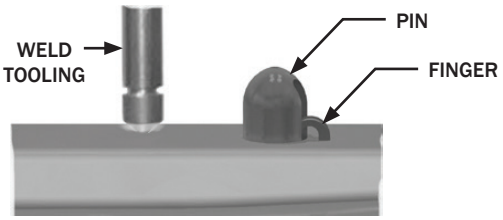
Properly apply clamping force to the part while considering material thickness relative to clamping range starting at the top of the part.



Clear the flange (maximum flange height from top of part is 5.5mm)



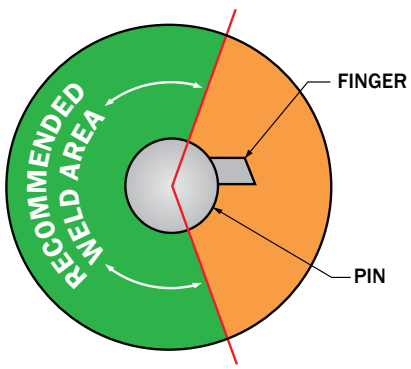
Clear other part features



Avoid weld tooling or contamination

Design the shape of the pin and orient the pin shape to the pin's mounting hole pattern.

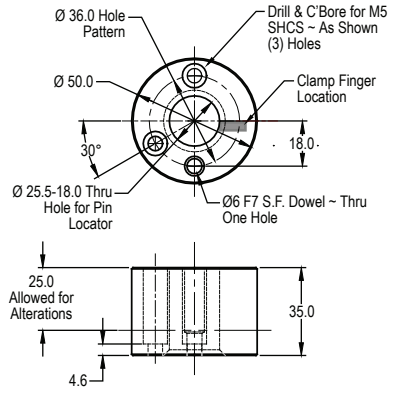
When designing your own rest block (donut), design the shape relative to the mounting hole pattern and the clamp finger location. (see pp 6-7)

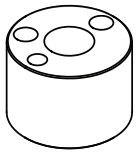


REST BLOCK (DONUT) ALTERATION

The donut (clamping surface) may be altered to suit specific applications. The donut may be removed, cut down or cut away to allow for work clearance or excessive material thickness. The standard donuts are made from 8620 and are carburized to Rockwell 'C' 58-62 to a case depth of 0.5mm-2.0mm [.02" to .08"]. When altering a donut, be sure to leave adequate clamping surface for the clamp finger to clamp against. If your clamp is non-standard, contact BTM for a drawing of your specific donut. When designing your own donut, design the shape relative to the mounting hole pattern and the clamp finger location.

Standard Rest Block Dimensions for Pin Clamps With Pin Diameters: 25.5-18mm [PLC63 & LPLC38]

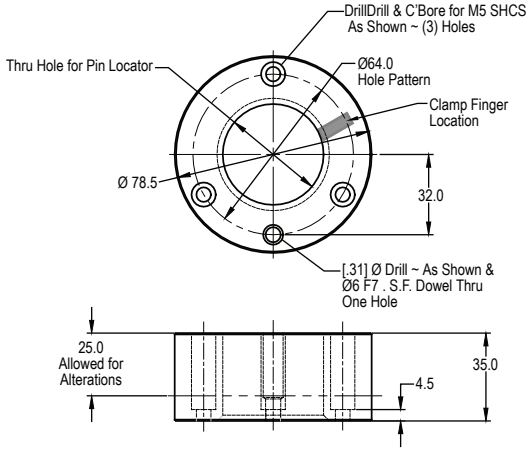


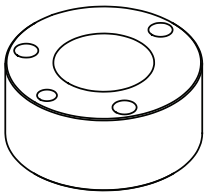


THE ALLOWABLE ALTERATION DIMENSION OF THE REST BLOCK (DONUT) DETAIL TO THE LEFT IS BASED ON A 35MM HIGH REST BLOCK.

Material: 8620
Hardness: R'c' 58-62 to a case depth of 0.5-2.0mm [.02-.08"]

Standard Rest Block Dimensions for Pin Clamps With Pin Diameters: 42.0-25.0mm [PLC63 & LPLC38]

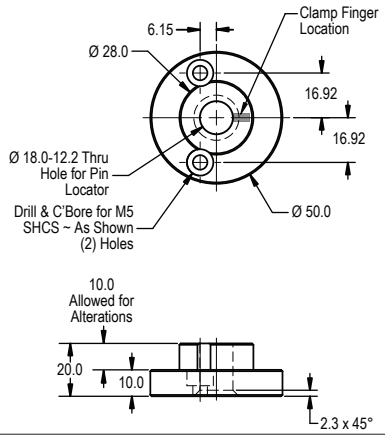


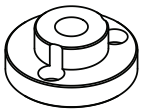


THE ALLOWABLE ALTERATION DIMENSION OF THE REST BLOCK (DONUT) DETAIL TO THE LEFT IS BASED ON A 35MM HIGH REST BLOCK.

Material: 8620
Hardness: R'c' 58-62 to a case depth of 0.5-2.0mm [.02-.08"]

Standard Rest Block Dimensions for Pin Clamps With Pin Diameters: 18.0-12.5mm [PLC45]

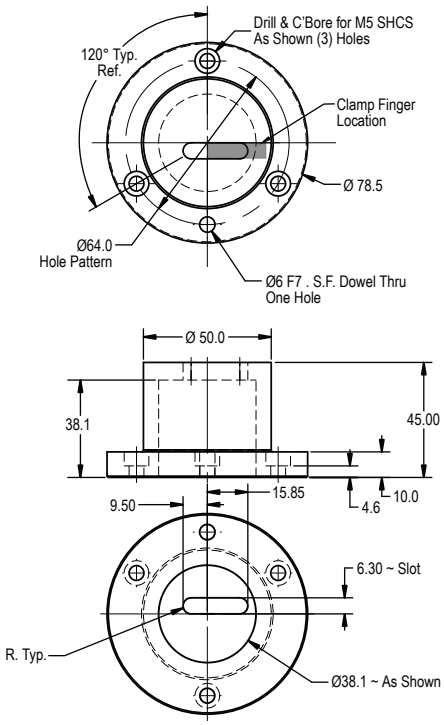


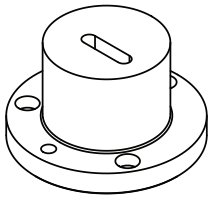


THE ALLOWABLE ALTERATION DIMENSION OF THE REST BLOCK (DONUT) DETAIL TO THE LEFT IS BASED ON A 20MM HIGH REST BLOCK.

Material: 8620
Hardness: R'c' 58-62 to a case depth of 0.5-2.0mm [.02-.08"]

Standard Rest Block Dimensions for Finger Clamps With Pin Diameters: 29-18mm [SFC63 & LSFC38]

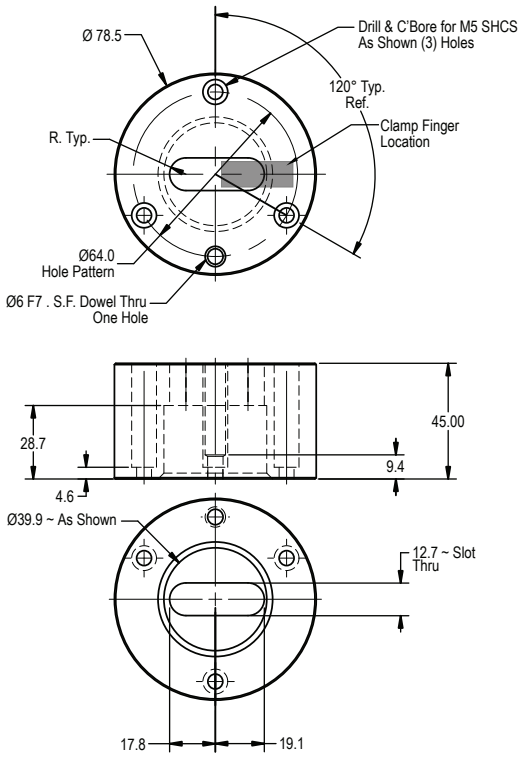


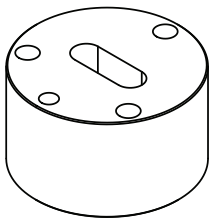


WHEN ALTERING TAKE NOTE OF CLEARANCE POCKET IN THE BOTTOM OF THE REST BLOCK (DONUT).

Material: 8620
Hardness: R'c' 58-62 to a case depth of 0.5-2.0mm [.02-.08"]

Standard Rest Block Dimensions for Finger Clamps With Pin Diameters: 40-30mm [SFC63 & LSFC38]





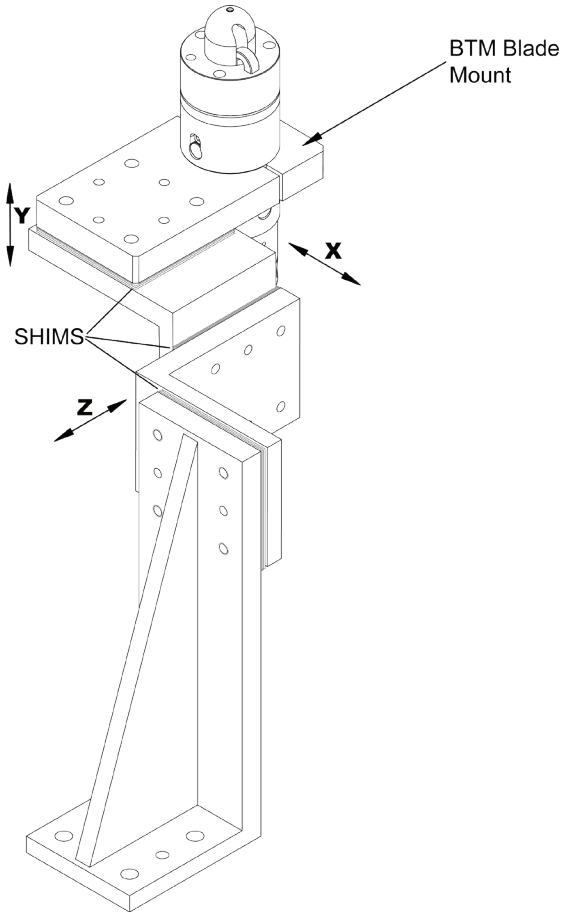
WHEN ALTERING TAKE NOTE OF CLEARANCE POCKET IN THE BOTTOM OF THE REST BLOCK (DONUT).

Material: 8620
Hardness: R'c' 58-62 to a case depth of 0.5-2.0mm [.02-.08"]

MOUNTING

Consider X, Y, and Z pin adjustment.

Adjust the pin depth by shimming blade mount or machining the rest block.



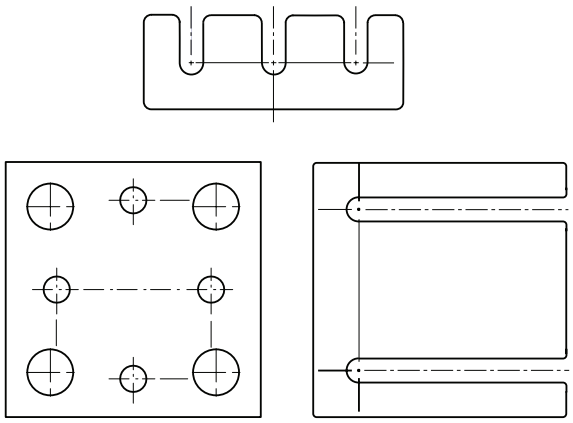
GLOBAL STANDARD COMPONENTS

NAAMS™

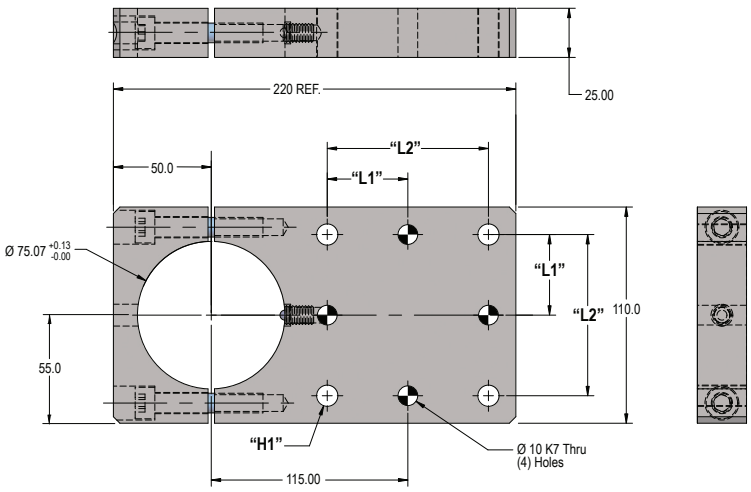
Assembly

BTM Blade Mounts with NAAMS mounting patterns are compatible with NAAMS shims as defined in the following specifications:

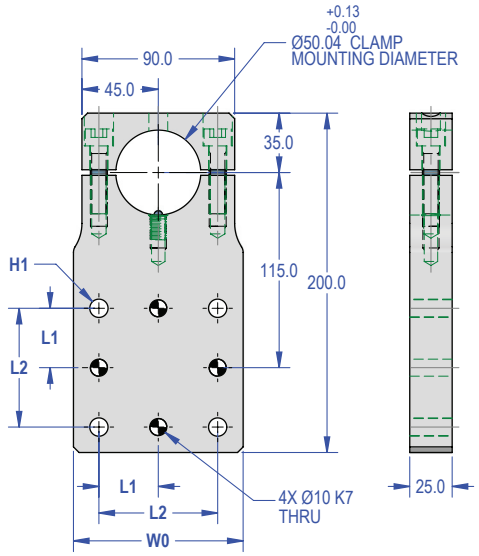
Spec Name	Description	Numbers
NAAMS J-10	Construction Spacer 3-Slot	ACSxxxS
NAAMS J-11	Spacer for 70x70 Mounting	ACSxxx
NAAMS J-13	Construction Shim 2-Slot	ACHxxx

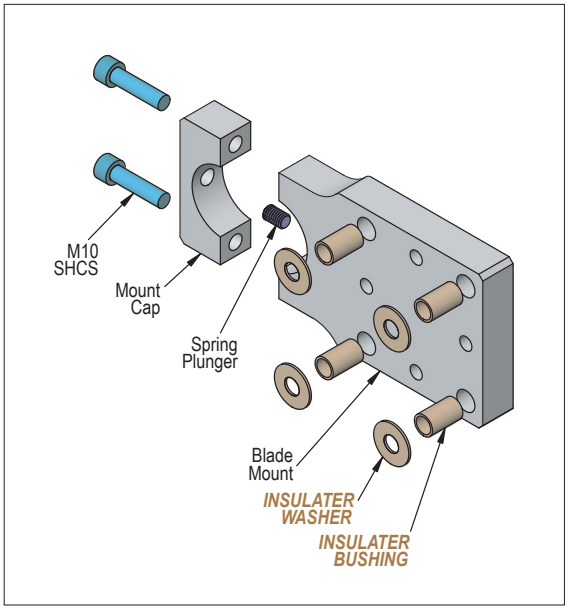


BLADE MOUNT [PLC63, SFC63, LPLC38, & LSFC38]



BTM Part Number	Mount Type	Ø H1 Thru (4) Holes	L1	L2
794100A	Insulated C-Flex Mount	12.0 Insulator Bushing	41.00	82.00
794100B	C-Flex Mount	12.1	41.00	82.00
794100C	Insulated NAAMS Mount	10.0 Insulator Bushing	35.00	70.00
794100D	NAAMS Mount	10.8	35.00	70.00





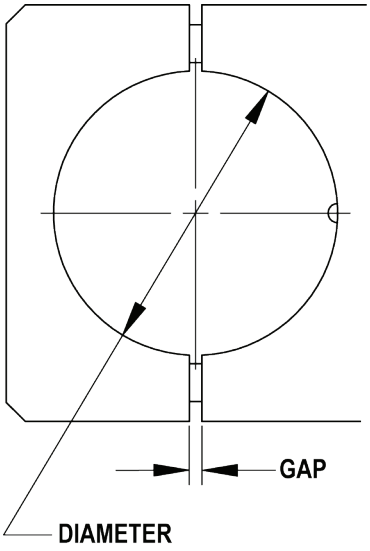
BTM Part Number	Mount Type	Ø H1 Thru (4) Holes	W0	L0	L1	L2
794400A	Insulated C-Flex Mount	12.0 Insulater Bushing	110.0	205.0	41.00	82.00
794400B	C-Flex Mount	12.1	110.0	205.0	41.00	82.00
794400C	Insulated NAAMS Mount	10.0 Insulater Bushing	100.0	200.0	35.00	70.00
794400D	NAAMS Mount	10.8	100.0	200.0	35.00	70.00

Insulated mounts are used in welding applications. Insulated mounts come with insulating washers and insulating bushings in the screw holes.

Note: It is the customer's responsibility to insulate any dowels required for mounting.

DESIGNING YOUR OWN MOUNT

When designing your own mount, it is critical to adhere to the configuration shown in the illustration below.



Clamp Size	Diameter
PLC-45	Ø 50.04 +0.13 -0.00
PLC-63, SFC-63, LPLC38, LSFC38	Ø 75.07 +0.13 -0.00

MOUNT SCREW TORQUE

Torque blade mount screws to 45.4N-m (33.5ft-lbs)

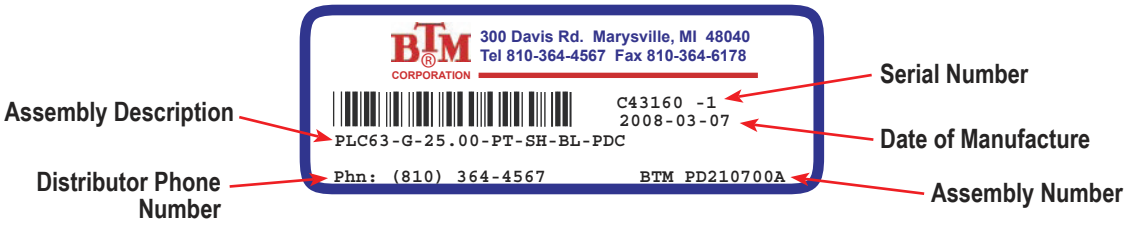
CAUTION! *- Do not over torque. This may cause cylinder distortion.*

IDENTIFICATION OF YOUR CLAMP

NOTE: BTM implemented a new numbering system for its pin and finger clamps in 2006. In 2007, BTM added tapered pin styles, standard or flanged hole pin options, and optional chrome pin coating.

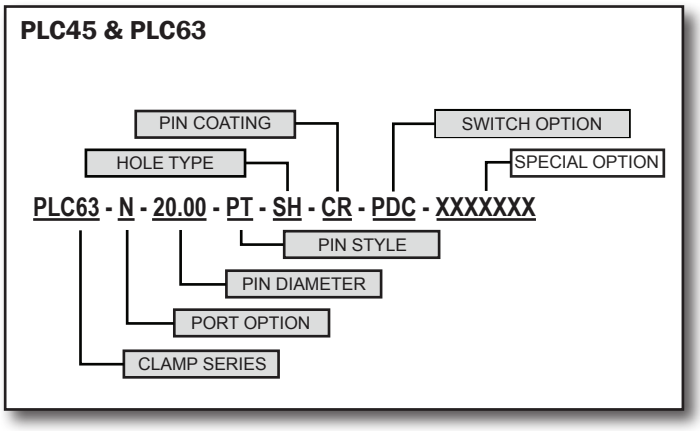
It is recommended to identify and record the model numbers before performing any service. A label is affixed to each clamp prior to shipment which lists the model and serial numbers.

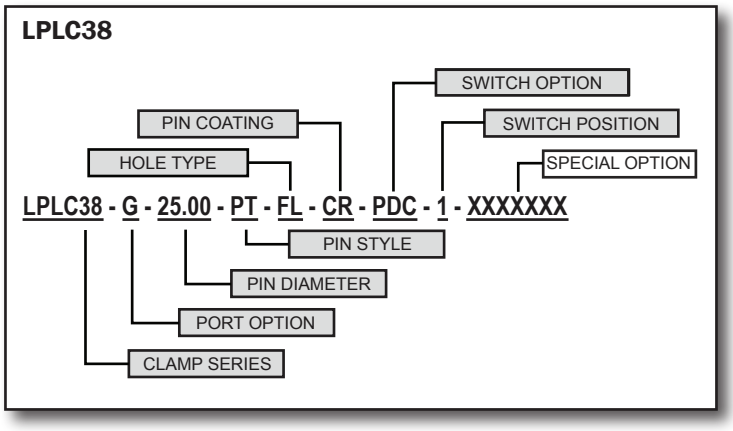
This label information must be used when reordering spare parts or complete pin clamps.



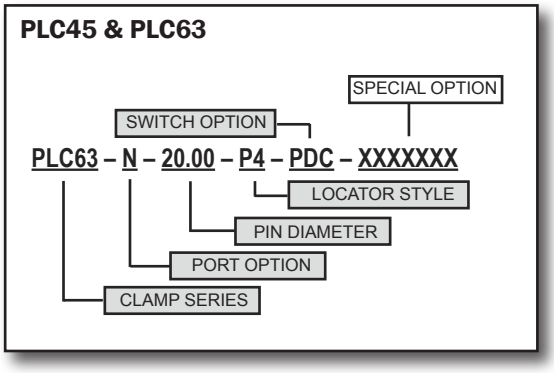
CLAMP ASSEMBLY DESCRIPTION BREAKDOWNS

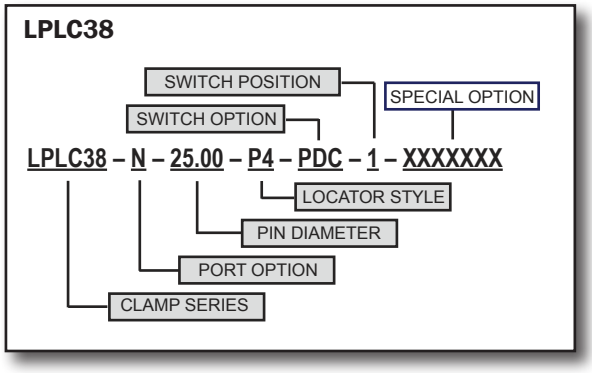
TAPERED PINS



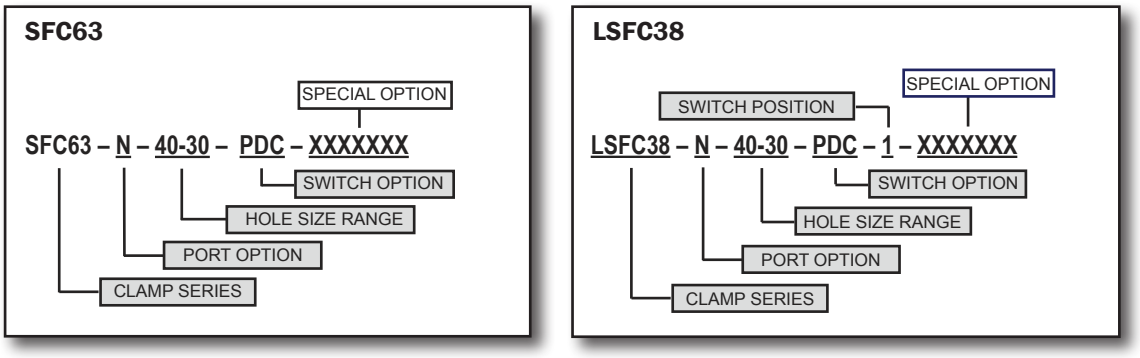


STRAIGHT PINS

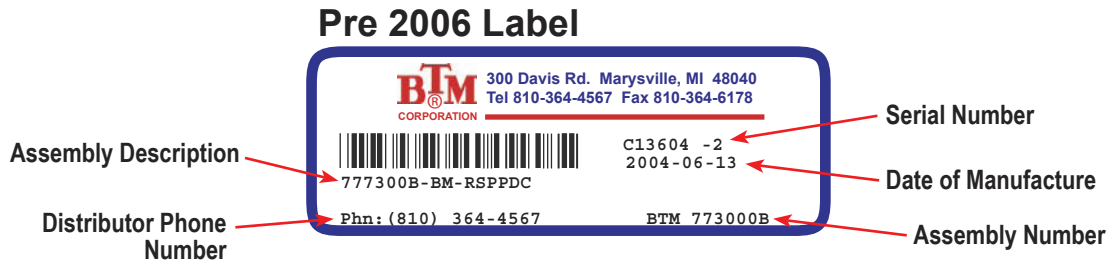


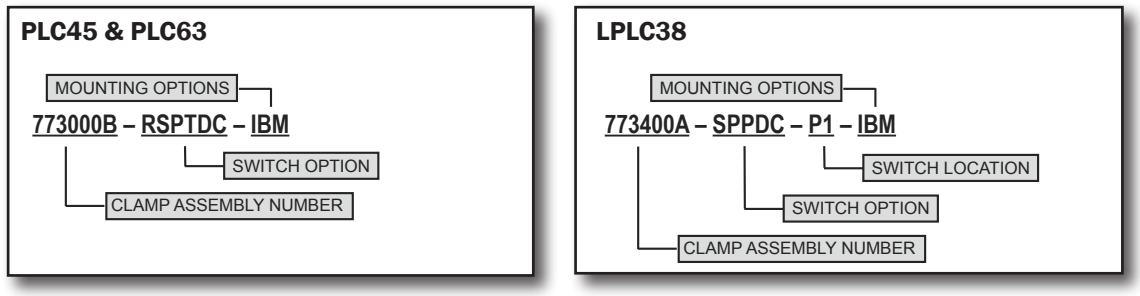


SINGLE FINGER CLAMPS



Clamps built prior to 2006 will have the following label configuration:





AIR SUPPLY

Recommended operating air pressure is 80PSI [5.5 BARs].

PORT INFORMATION:
PLC63 & SFC63 Clamps: 3/8 NPT or G1/4
PLC 45, LPLC38 & LSFC38 Clamps: 1/8NPTF or G1/8

All clamps are lubricated for the life of the unit at the factory. Clean dry air is required for operation. In-line lubrication is not required but may be used.

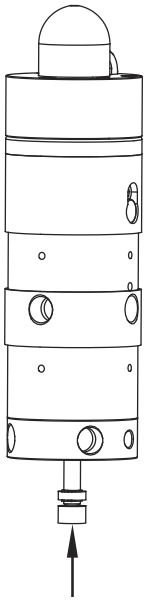
Note: Once lubricated air is used, it must continue to be used for the life of the clamp.

MANUALLY OPENING CLAMPS

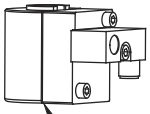
WARNING! - *Make sure the air supply is disconnected.*

NON-LOCKING CLAMPS

Removal of the rear switch package is done by first removing the connector cord. Next, remove one 5mm S.H.C.S. located at the back of the switch package (4mm allen wrench required).



PUSH TO MANUALLY OPEN CLAMP



REMOVE SWITCH PACKAGE

REMOVE M5 SHCS *(4MM ALLEN WRENCH REQUIRED)*

LOCKING CLAMPS

To manually unlock and open the LPLC and LSFC clamps, pull the unlock rod. Pushing the rod manually closes and locks the clamp.

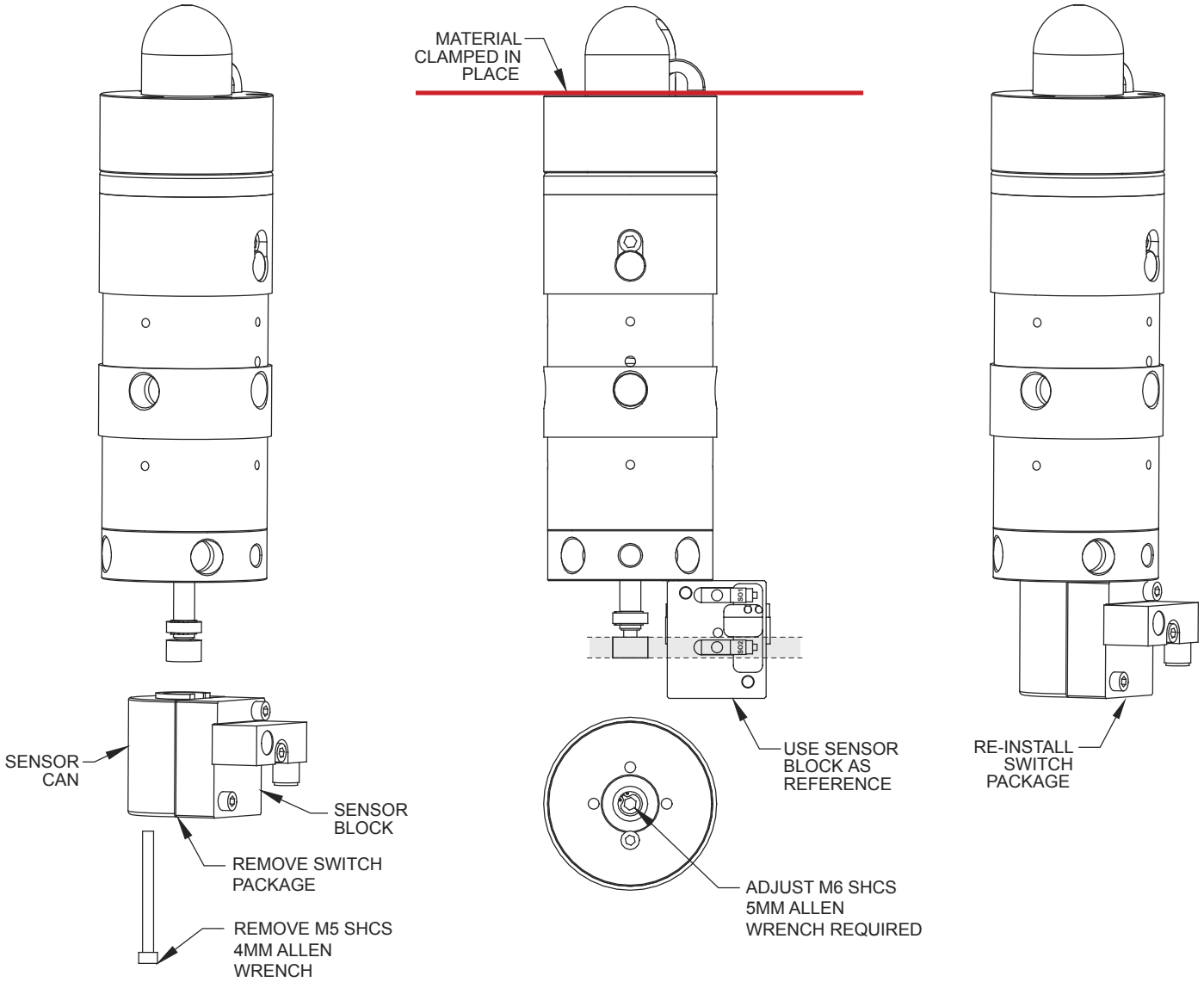
ADJUSTING REAR SENSING FLAG

NON-LOCKING CLAMPS ONLY

The rear sensing flag should be properly adjusted to match the thickness of the material being clamped.
To adjust the rear flag, you must first remove the rear switch package.
Remove the two screws holding the sensor block to the sensor can and remove the block.
Use the sensor block as a reference for adjusting the rear flag (see below).

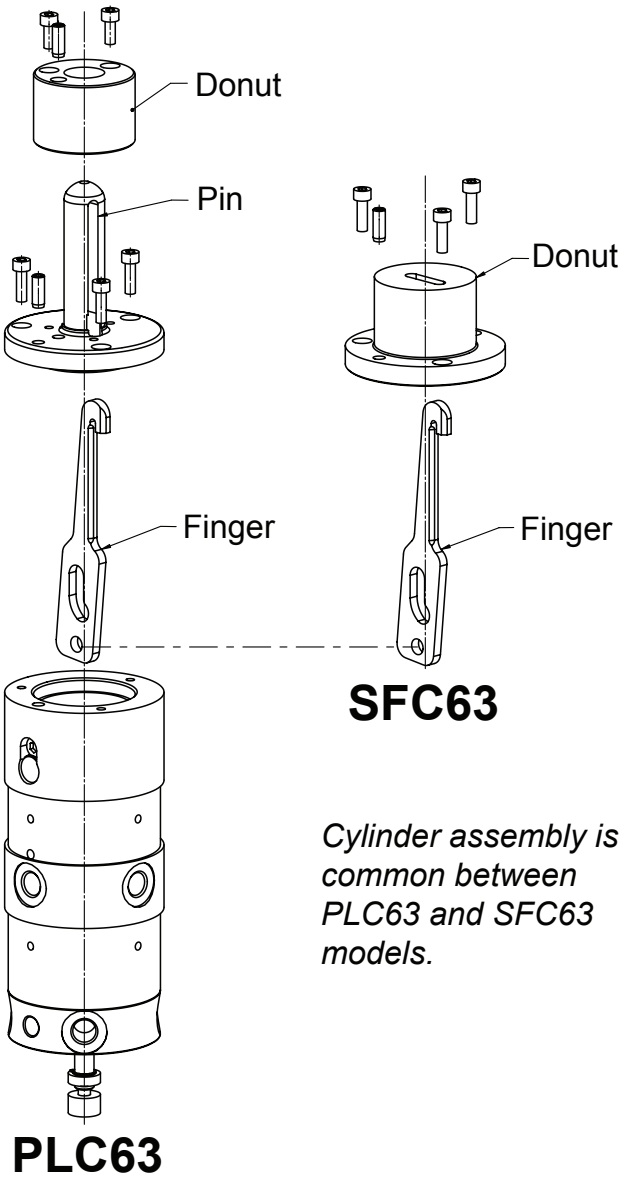
With the appropriate material thickness clamped in place, adjust the 6mm S.H.C.S. enclosed in the rear flag so the flag is in line with the closed position sensor head (a 5mm allen wrench is required). Re-assemble and replace the switch package.

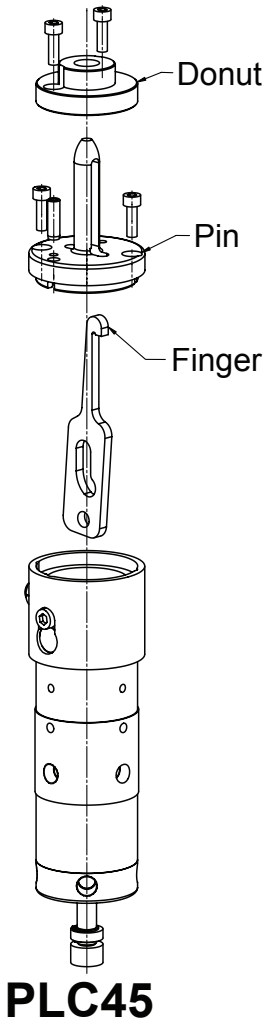
Check for proper sensing.



MAIN COMPONENT IDENTIFICATION

NON-LOCKING CLAMPS





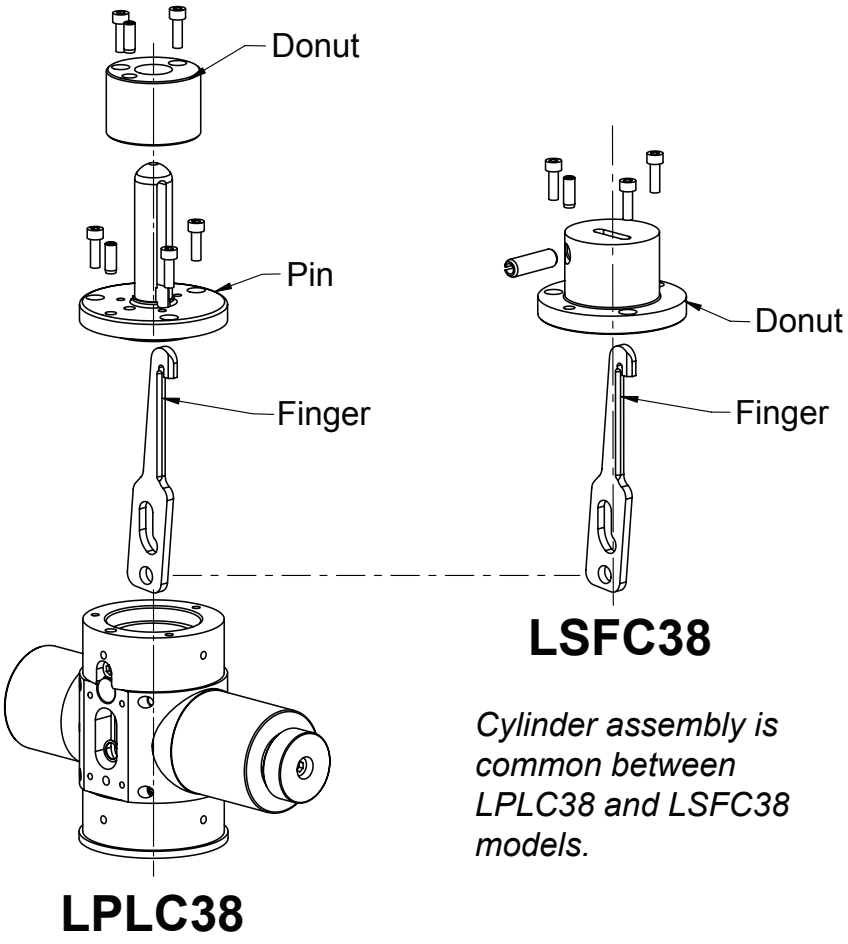
There are (3) main components that may be replaced or altered in PLC and LPLC clamps: the Pin, the Finger, and the Rest block (donut).

In SFC and LSFC clamps, there are (2) main components which may be replaced: the Finger and the Rest block (donut).

With PLC's, the Rest block (donut) is matched with a pin diameter, so if the pin diameter changes, the rest block (donut) will automatically have to be changed also. The fingers typically work in a range of pin diameters, so it may not be necessary to always replace a finger if the pin diameter changes.

MAIN COMPONENT IDENTIFICATION

LOCKING CLAMPS



Cylinder assembly is common between LPLC38 and LSFC38 models.

DISASSEMBLING MAIN COMPONENTS

PLC 63

If the clamp still has air pressure, cycle the clamp so that the finger is retracted inside of the pin.

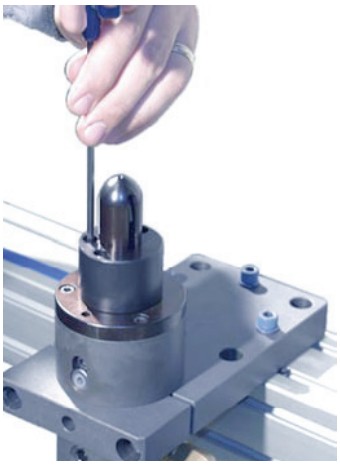
**** If the clamp does not have air pressure, you will need to remove the switch package to manually retract the finger. Please refer to p.12 for directions on this procedure. ****

CAUTION! - *Before removing any components, disconnect the Air & Electrical Supply from the pin clamp. Failure to do this could result in injury.*

18-25mm Pins

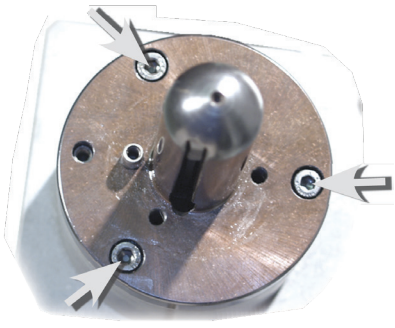
26-40mm Pins

The rest block (donut) is secured to the locating pin by M5 socket head cap screws and an alignment dowel. *18-25mm pin clamps have (2) screws, 26-40mm pin clamps have (3) screws.*

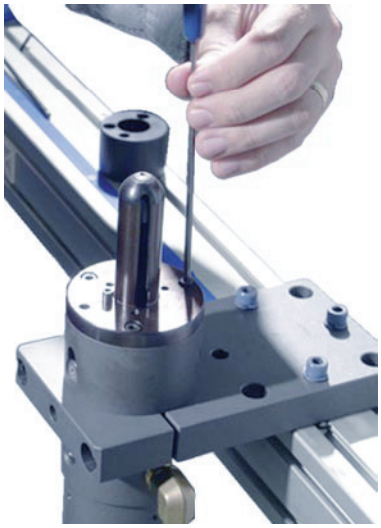


Remove the mounting screws from the top of the rest block (donut) using a 4mm allen wrench.

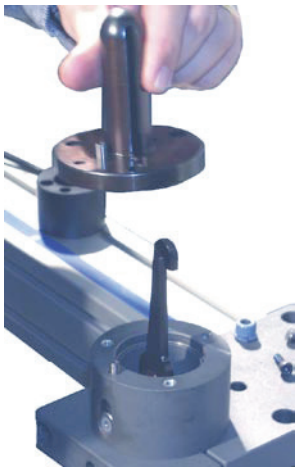
Once the screws have been removed, disengage the rest block (donut) from the alignment dowel and pull it off the pin.



The locating pin is secured to the clamp housing by (3) M5 socket head cap screws and an alignment dowel located at the base of the pin.



Remove the three mounting screws using a 4mm allen wrench.



Disengage the locating pin from the alignment dowel and pull it straight up to clear the finger and remove it from the housing of the clamp.

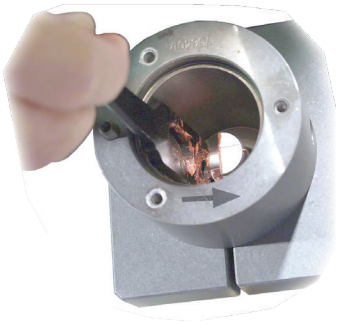
Remove the retaining screw located above the cam pin. A 5mm allen wrench is required. The head of the retaining screw will act as a jack to help remove the cam pin from the clamp housing.

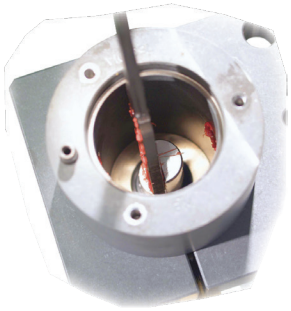
Pull the cam pin straight out to remove it.

Slide the finger off of the drive pin and out of the clamp.

RE-ASSEMBLING MAIN COMPONENTS

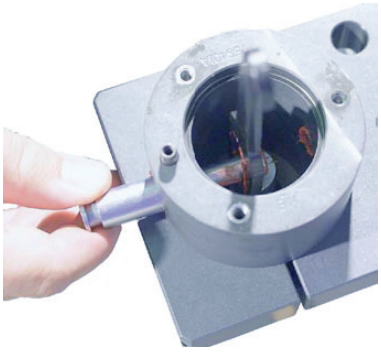
Make sure that the finger and the drive pin are properly greased.



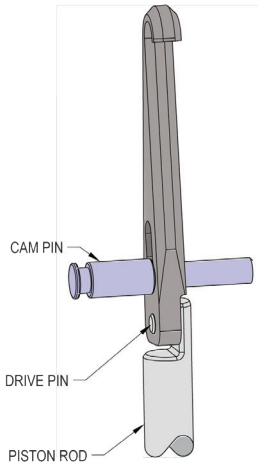


Slide the finger onto the drive pin on the piston rod of the clamp.

Make sure that the cam pin is properly greased.



Slide the camp pin into the cam pin hole and through the cam slot in the finger.

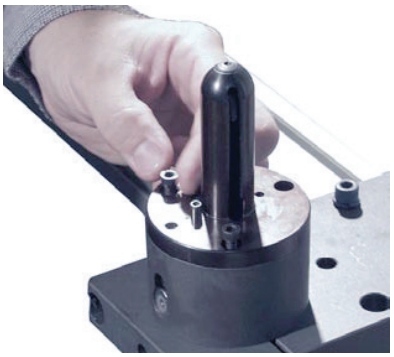


The finger must be trapped between the piston rod and the shoulder of the cam pin.

Insert the guide screw above the cam pin. Make sure that the head of the screw falls into the groove on the head of the cam pin. Tightening the screw will draw the cam pin into place.

Install the pin over the finger. Be sure to align the dowel pin in the clamp body with the dowel hole in the pin flange.

It may be necessary to use a brass hammer, or a rubber mallet to gently tap the pin so it is seated properly.



Replace the (3) screws and torque them to 85 in-lbs.

Install the rest block (donut) over the pin. Be sure to align the dowel pin in the finger flange with the dowel hole in rest block (donut).

Replace the (2) or (3) screws [depending on the size] and torque them to 85 in-lbs.

DISASSEMBLING MAIN COMPONENTS

SFC 63

To disassemble the SFC63, follow the same procedure as for the PLC63. The only difference is that there is no locating pin to remove. The rest block (donut) of the SFC63 is mounted using the same screw holes and alignment dowel as the PLC63 Locating Pin.

DISASSEMBLING MAIN COMPONENTS

PLC 45

Disassembling the PLC45 is virtually the same as disassembling the PLC63, with a few minor exceptions as noted below. For any steps that are not clear, reference the disassembly procedure for the PLC63 in the previous pages.

The rest block (donut) is fastened to the pin flange with (2) SHCS. They are removed with a 4mm allen wrench.

There is no alignment dowel between the rest block (donut) and the pin.

The pin is fastened to the clamp housing with (2) SHCS and an alignment dowel. Remove the screws with a 4mm allen wrench. Disengage the pin flange from the dowel and remove the pin.

Remove the Cam Pin Screw using a 5mm allen wrench.

With the retaining screw removed, the cam pin can be pushed out from the opposite end.

RE-ASSEMBLING MAIN COMPONENTS

Make sure that the drive pin, cam pin, and finger are properly greased. Re-assemble the components using the procedure for the PLC63, adhering to the exceptions noted above.

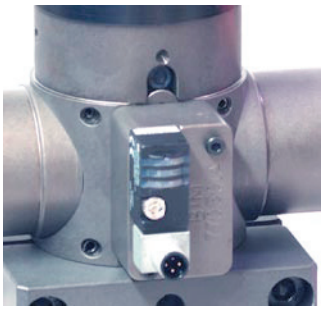
DISASSEMBLING MAIN COMPONENTS

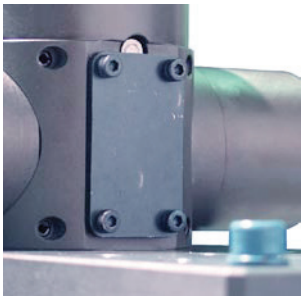
LPLC 38

If the clamp still has air pressure, cycle the clamp so that the finger is retracted inside of the pin.

**** If the clamp does not have air pressure, you will need to manually retract the finger. Please refer to p.12 for directions on this procedure. ****

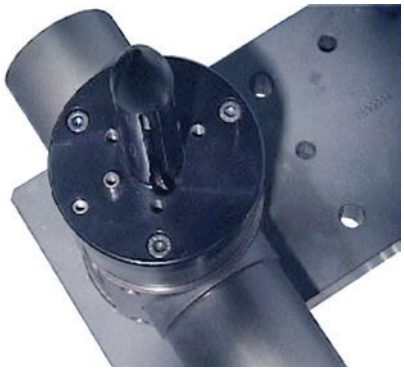
CAUTION! - *Before removing any components, disconnect the Air & Electrical Supply from the pin clamp. Failure to do this could result in injury.*





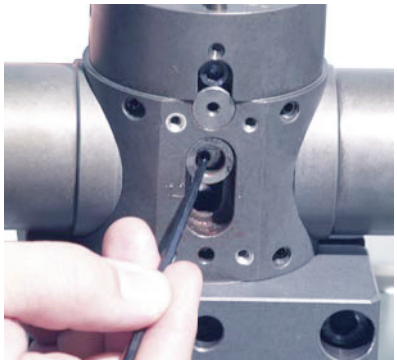
Remove the switch package and the cover plate using a 3mm allen wrench.

The rest block (donut) is secured to the location pin by M5 socket head cap screws and an alignment dowel. 18-25mm pin clamps have (2) screws, 26-40mm pin clamps have (3) screws. Remove the rest block (donut) screws with a 4mm allen wrench.

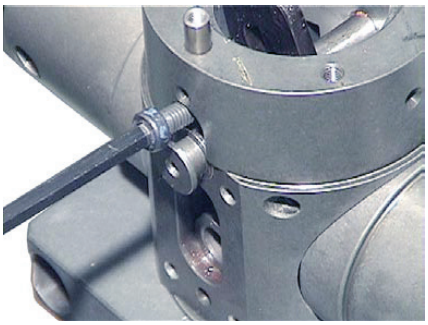


The locating pin is secured to the clamp housing by (3) M5 socket head cap screws and an alignment dowel located at the base of the pin. Remove the three mounting screws using a 4mm allen wrench. Disengage the locating pin from the alignment dowel and pull it striaght up to clear the finger and remove it from the housing of the clamp.

Remove the snap ring from one end of the drive pin.

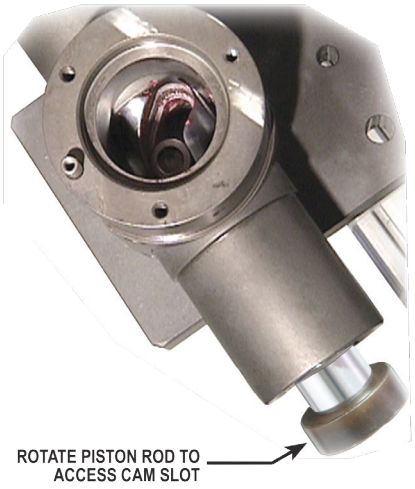


Push the drive pin through the rollers and remove it from the opposite side of the clamp.

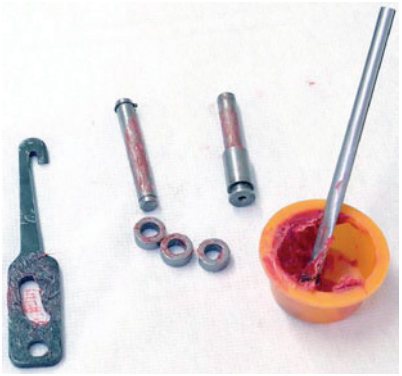


Remove the retaining screw located above the cam pin. A 5mm allen wrench is required. The head of the retaining screw will act as a jack to help remove the cam pin from the clamp housing.

Pull the cam pin straight out to remove it. Pull the clamp finger straight up to remove it from the piston slot.



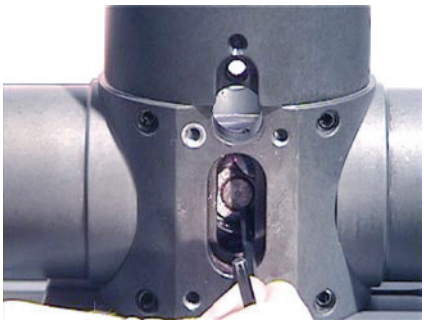
The center roller can only be accessed through the top of the clamp. Rotate the piston rod to orient the cam slot to access the center roller.



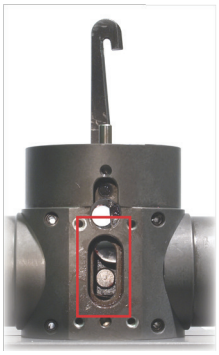
Before re-assembly, make sure that the clamp finger, cam pin, drive pin and all three rollers are properly greased.

Install one roller into the cam slot in the piston. Orient the piston so the roller is perpendicular to the drive pin hole and the finger slot is facing up.

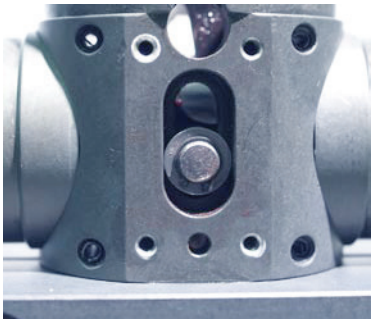
Install one roller onto the drive pin. Insert the drive pin until it engages the center roller.



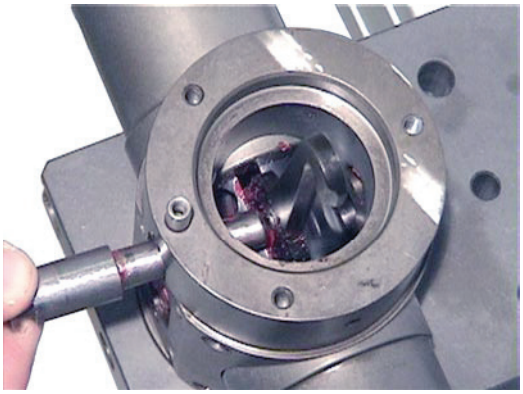
Hold the roller in place while the pin is inserted.



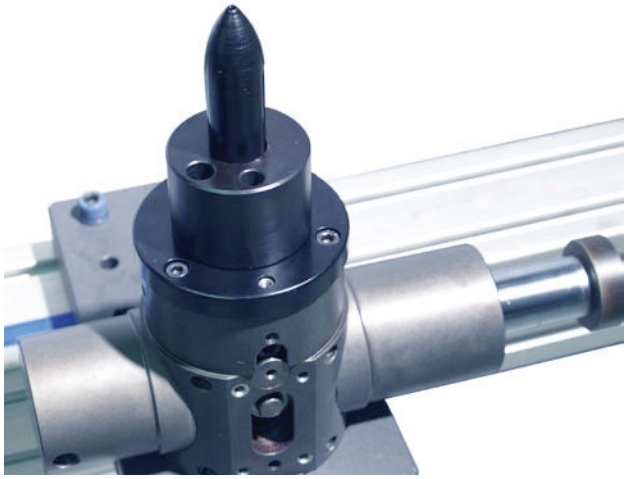
Install the finger so the drive pin hole lines up with the drive pin. Finish installing the drive pin.



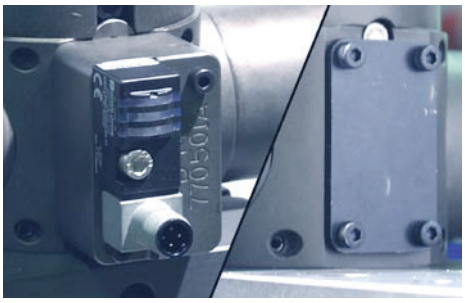
Install the final roller and replace the snap ring.



Insert the camp pin through the cam slot in the finger. Install the cam pin screw.



Install the pin over the finger. Be sure to align the dowel pin in the clamp body with the dowel hole in the pin flange. Replace the (3) screws and torque them to 85 in-lbs. Install the rest block (donut) over the pin. Be sure to align the dowel pin in the finger flange with the dowel hole in rest block (donut). Replace the (2) or (3) screws [depending on the size] and torque them to 85 in-lbs.



Replace the switch package and cover plate.

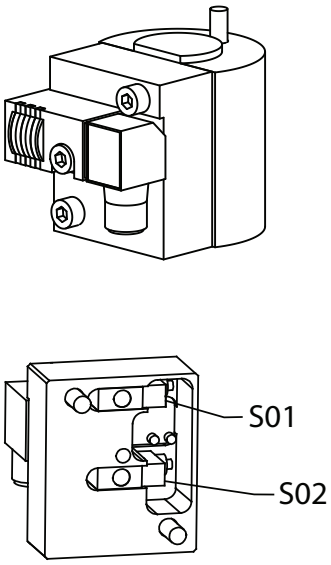
DISASSEMBLING MAIN COMPONENTS

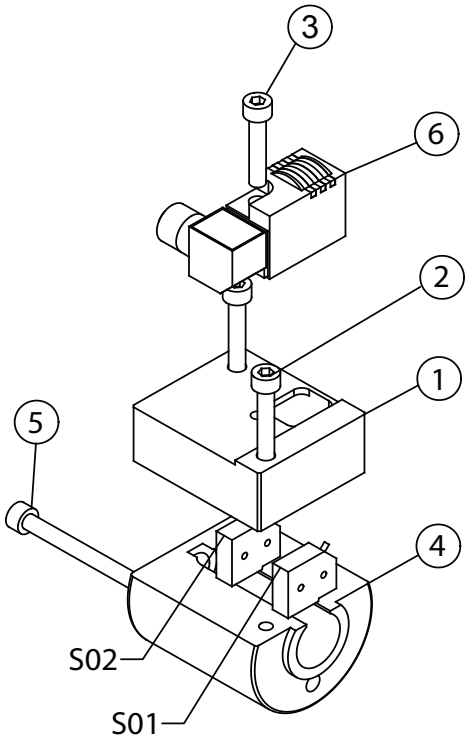
LSFC 38

To disassemble the LSFC38, follow the same procedure as for the LPLC38. The only difference is that there is no locating pin to remove. The rest block (donut) of the LSFC38 is mounted using the same screw holes and alignment dowel as the LPLC38 Locating Pin.

PROXIMITY SWITCH PACKAGES

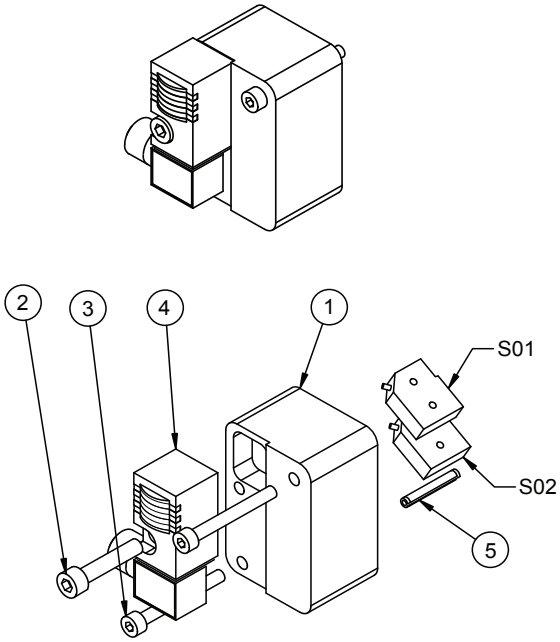
NON-LOCKING CLAMPS (PLC 63, PLC 45, SFC 63)

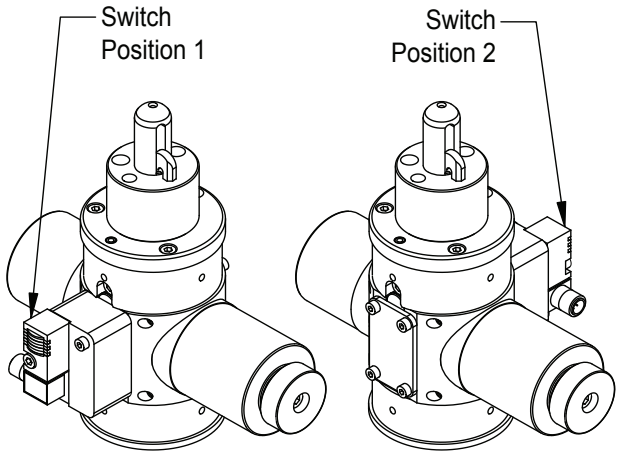




Det	Qty	Description	BTM No.
1	1	Sensor Block	753701A
2	2	M5 x 30 SHCS	016452
3	1	M5 x 25 SHCS	015493
4	1	Sensor Can	744303A
5	1	M5 x 55 SHCS	018495
6	1	P+F DC Status Controller Switch	020486

LOCKING CLAMPS (LPLC 38 & LSFC 38)

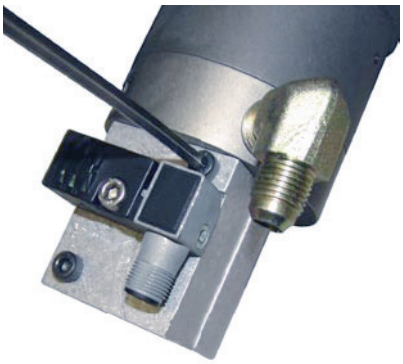




Det	Qty	Description	BTM No.
1	1	Sensor Block	770501A
2	1	SHCS: M5X0.8 X 25	015493
3	2	SHCS: M4X0.7 X 35	018486
4	1	P+F DC Status Controller Switch	020486
5	1	M5 x 55 SHCS	019924

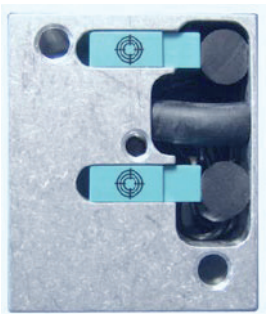
CHANGING PROXIMITY SWITCHES

NON-LOCKING CLAMPS ONLY



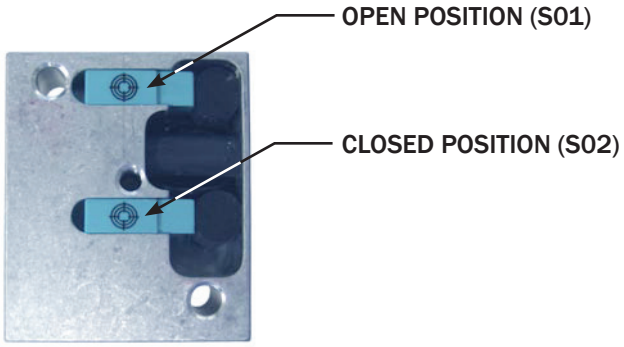
Remove the shielded electrical cable from the connector on the switch. Remove the the two screws which retain the sensor block to the sensor can remove the block.

Remove the screw which retains the switch to the sensor block.



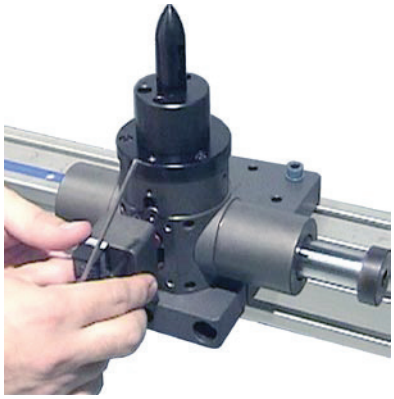
Remove the rubber retainers and remove the sensor heads from the block. Sensor heads are retained by a slip fit.

Pass the sensor heads through the clearance hole in the sensor block to remove the switch.

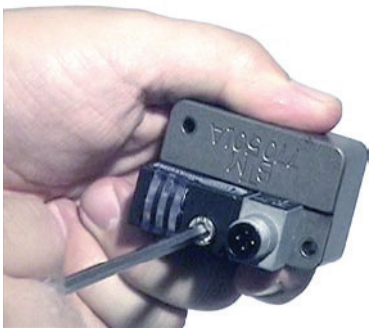


Reverse the procedure to install the new switch, adhering to the configuration shown above. Note that the sensor head (S02) is mounted to sense the clamp in the closed and clamped position.

LOCKING CLAMPS ONLY

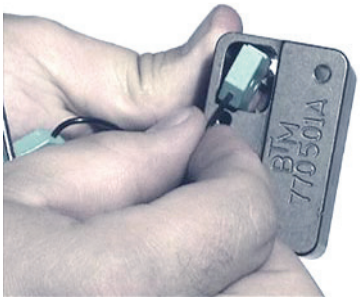


Remove the shielded electrical cable from the connector on the switch. Remove the two screws which retain the sensor block to the clamp body and remove the block.

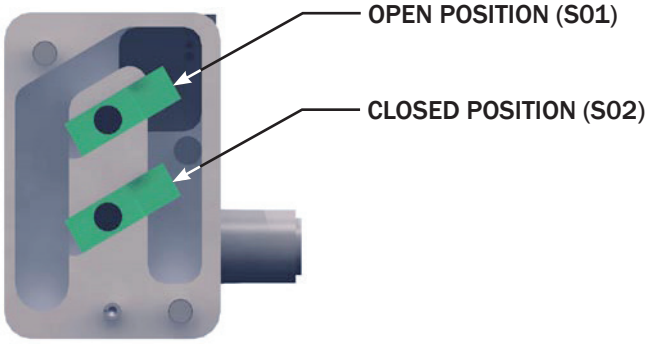


Remove the screw which retains the switch to the sensor block.

Remove the rubber retainers and remove the sensor heads from the block. Sensor heads are retained by a slip fit.



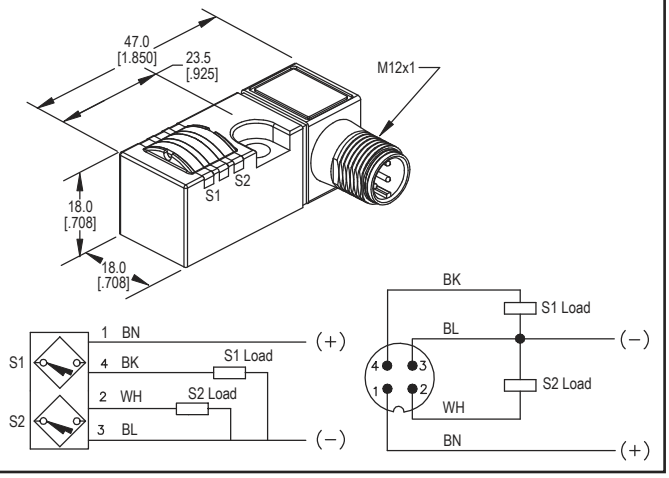
Pass the sensor heads through the clearance hole in the sensor block to remove the switch.



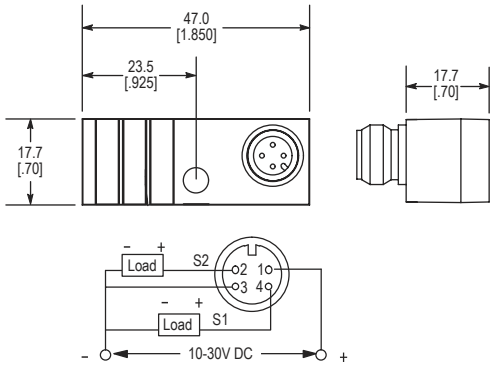
Reverse the procedure to install the new switch, adhering to the configuration shown above. Note that the sensor head (S02) is mounted to sense the clamp in the closed and clamped position.

PROXIMITY SWITCH INFORMATION

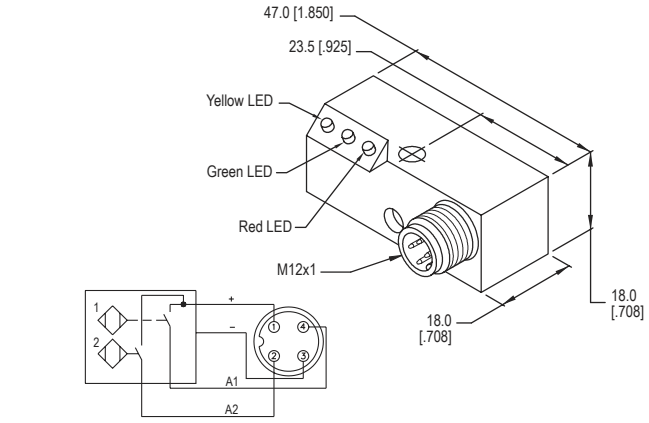
PDC - PEPPERL+FUCHS DC
NBN2-F581-160S6-E8-V1



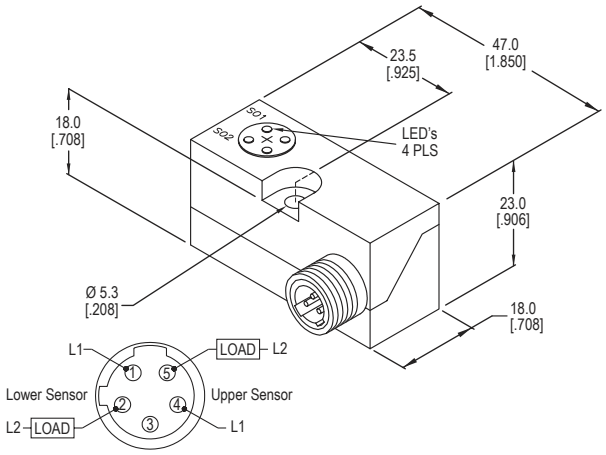
ADC - ALLEN BRADLEY DC
871D-MW2GP165A-D4



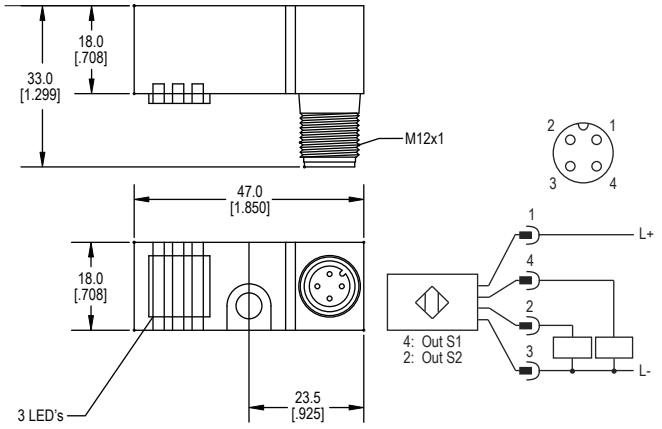
TDC - TURCK DC
Ni2Q6.5AP6-0.10-FS4.4X3/S304



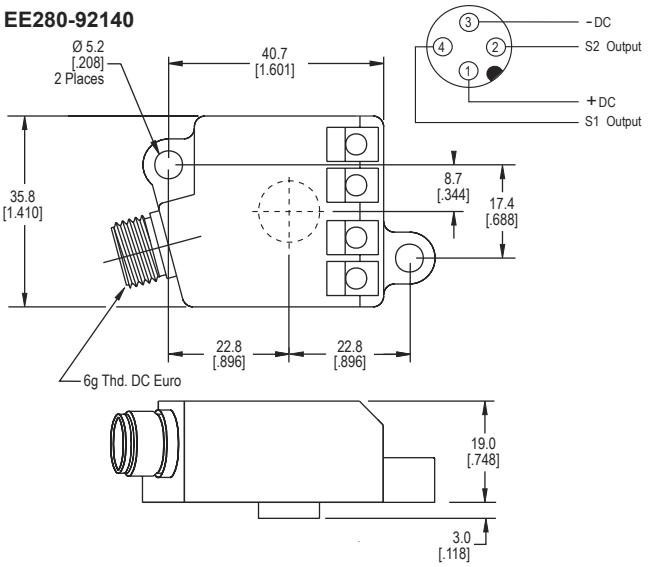
TAC TURCK AC
Ni2-Q6.5-ADZ32-0.16-FSB5.4X4/S304



EDC - EFFECTOR DC
IN5375



NDC - NAMCO DC
EE280-92140



PREVENTATIVE MAINTENANCE

Keep clamps free of contamination build up. Contamination build up could cause a change of material location or locating performance.

Keep the drain hole in the clamp body free from contamination. This will allow fluid from weld guns to drain out of the upper body cavity. Fluid build up could cause corrosion of the components and lead to clamp failure. The drain hole is located at the bottom of the upper mounting area.

CYLINDER LUBRICATION

Cylinder seals are self-lubricating and do not require in-line air lubrication. In-line air lubrication can be used, but once used it must not be discontinued.

SPARE/REPLACEMENT PARTS

STANDARD CLAMPS

A complete listing of components for all of BTM's standard pin and finger clamps is shown on the following pages. If your clamp is standard, it will have a part number similar to PLC63-N-20.00-P4-PDC, or PLC63-G-25.00-PT-SH-BL-PDC. (See pp 10-11 for more details on identifying part numbers). There will be no special part number designation. Spare parts for standard clamps can be ordered by using the BTM part numbers shown in the tables next to the exploded views.

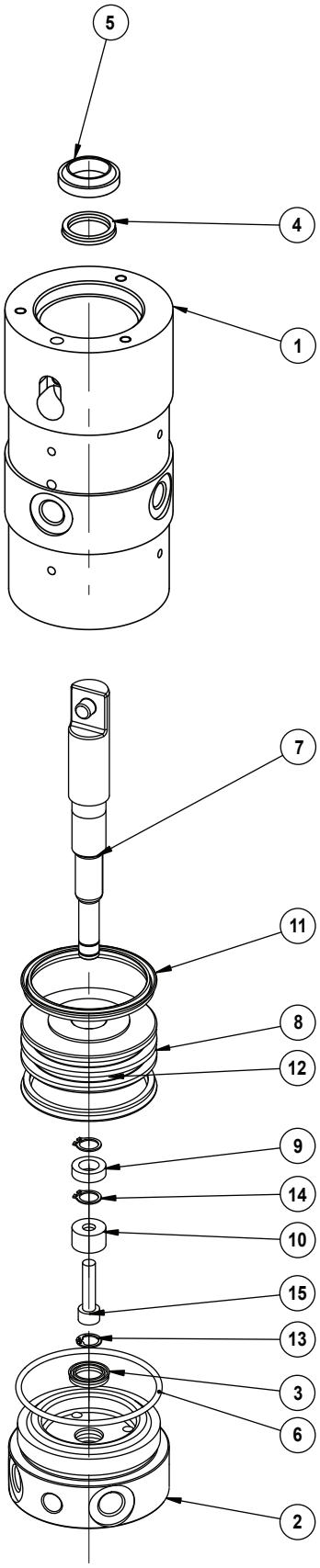
SPECIAL CLAMPS

To order spare components for a Special BTM pin or finger clamp, you may need to contact BTM to obtain a list of components used in your clamp. If your clamp is special, it will have a part number with either a special assembly number at the beginning or at the end of the part number, such as 7xxxxxx-RSPPDC, PLC63-N-22.25-P4-PDC-PDxxxxxxx, or PLC63-G-25.00-PT-SH-BL-PDC-PDxxxxxxx. (See pp-10-11 for assembly number. Or, you can order the component by referencing the component description along with the special assembly number. For example, you can order:the component by referencing the component description along with the speicial assembly number. For example, you can order: Locating Pin for 7xxxxxx or Locating Pin for PDxxxxxxx.

PLC63 and SFC63 Cylinder Components

Det.	Qty	Description	BTM No.	SK
1	1	PLC2-63 - BODY - 3/8 NPT	756401A	
	1	PLC2-63 - BODY - G1/4	PD200001A	
2	1	PLC2/SFC2-63 - END CAP RING - 3/8 NPT	756403A	
	1	PLC2/SFC2-63 - END CAP RING - G1/4	PD200002A	
3	1	PARKER U-CUP PACKING	018085	*
4	1	PARKER U-CUP PACKING	020292	*
5	1	WIPER RING - .75 ROD.	020284	*
6	1	O-RING	004949	*
7	1	PLC2 PISTON ROD: CENTERED FINGERS	756701A	
	1	PLC2 PISTON ROD: OFF-CENTER FINGERS	756402A	
8	1	PLC2/SFC2-63 - PISTON	756404A	
9	1	PLC2/SFC2- FRONT FLAG	756405A	
10	1	PLC2/SFC2 - REAR FLAG	756406A	
11	2	3/16 C/S E4 -U-CUP SEAL -.2.125	017657	*
12	1	SPS FLEX LOC NUT	001429	
13	1	INTERNAL RETAINING RING	013663	
14	2	EXTERNAL RETAINING RING	001238	
15	1	SHCS: M6X1.0 X 25 NYLON PATCH	019920	

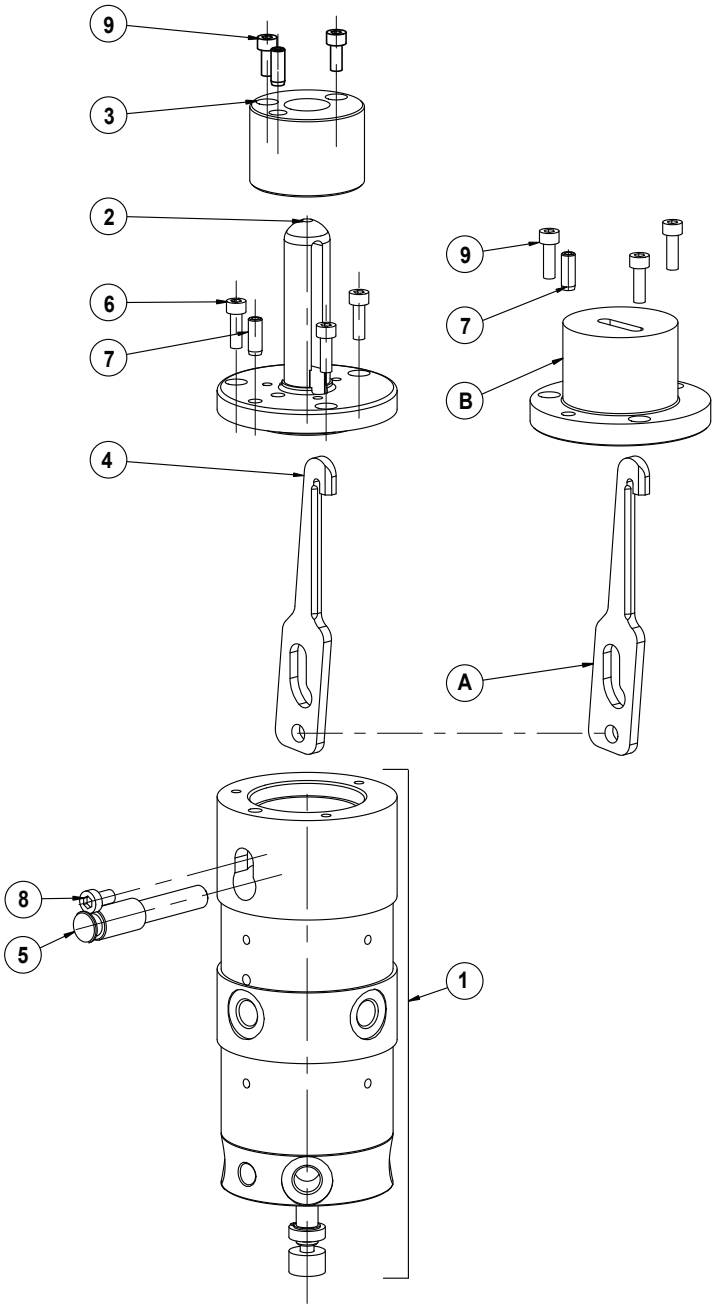
Seal Kit - BTM No. 024357
*includes all items marked **



Main Assembly Components:

PLC63

	DET.	QTY	DESCRIPTION	BTM No.	Chrome Pin
MAIN CYL. ASSY	1	1	63mm CYL ASSY: 3/8 NPT OFF-CTR	PD200100A	
		1	63mm CYL ASSY: 3/8 NPT ON-CTR	PD200100B	
		1	63mm CYL ASSY: G1/4 OFF-CTR	PD200000A	
		1	63mm CYL ASSY: G1/4 ON-CTR	PD200000B	
20mm PIN DIA.	2	1	20.00mm DIA. PIN - 2 WAY	PD200201B	
		1	20.00mm DIA. PIN - 4 WAY	PD200201A	
		1	20.00mm DIA. PIN - TAPERED SH	PD210601A	PD210601ACR
		1	19.80mm DIA. PIN - TAPERED SH	PD210601B	PD210601BCR
	3	1	20.00mm DONUT	743706A	
	4	1	20mm FINGER	743702A	
		1	20mm FINGER TAPERED	PD210602A	
25mm PIN DIA.	2	1	25.00mm DIA. PIN - 2 WAY	791301B	
		1	25.00mm DIA. PIN - 4 WAY	777501A	
		1	25.00mm DIA. PIN - TAPERED FL	PD210701A	PD210701ACR
		1	24.80mm DIA. PIN - TAPERED FL	PD210701B	PD210701BCR
		1	25.00mm DIA. PIN - TAPERED SH	PD210702A	PD210702ACR
		1	24.80mm DIA. PIN - TAPERED SH	PD210702B	PD210702BCR
	3	1	25.00mm DONUT	777502A	
	4	1	25mm FINGER	757203A	
30mm PIN DIA.	2	1	30.00mm DIA. PIN - TAPERED FL	PD210801A	PD210801ACR
		1	29.80mm DIA. PIN - TAPERED FL	PD210801B	PD210801BCR
		1	30.00mm DIA. PIN - TAPERED SH	PD210803A	PD210803ACR
		1	29.80mm DIA. PIN - TAPERED SH	PD210802B	PD210802BCR
	3	1	30.00mm DONUT	034149	
	4	1	30mm FINGER TAPERED	PD210802A	
35mm PIN DIA.	2	1	35.00mm DIA. PIN - 2 WAY	791001A	
		1	35.00mm DIA. PIN - 4 WAY	773501E	
		1	35.00mm DIA. PIN - TAPERED SH	PD210901A	PD210901ACR
		1	34.80mm DIA. PIN - TAPERED SH	PD210901B	PD210901BCR
	3	1	35.00mm DONUT	791201C	
	4	1	35mm FINGER	773501C	
		1	35mm FINGER TAPERED	PD210902A	
40mm PIN DIA.	2	1	40.00mm DIA. PIN - 2 WAY	PD200801B	
		1	40.00mm DIA. PIN - 4 WAY	753301B	
		1	40.00mm DIA. PIN - TAPERED FL	PD211001A	PD211001ACR
		1	39.80mm DIA. PIN - TAPERED FL	PD211001B	PD211001BCR
		1	40.00mm DIA. PIN - TAPERED SH	PD211002A	PD211002ACR
		1	39.80mm DIA. PIN - TAPERED SH	PD211002B	PD211002BCR
	3	1	40.00mm DONUT	753103A	
	4	1	40mm FINGER	753302A	
	5	1	CAM PIN (20-25mm)	743704A	
		1	CAM PIN (35-40mm)	753303A	
	6	3	SHCS: M5X0.8 X 16	015218	
	7	2	DOWEL: PULL M6 X 16	018992	
	8	1	M6 x 10 LOW HD. SCS.	018777	
	9	2 or 3	SHCS: M5X0.8 X 12	016045	



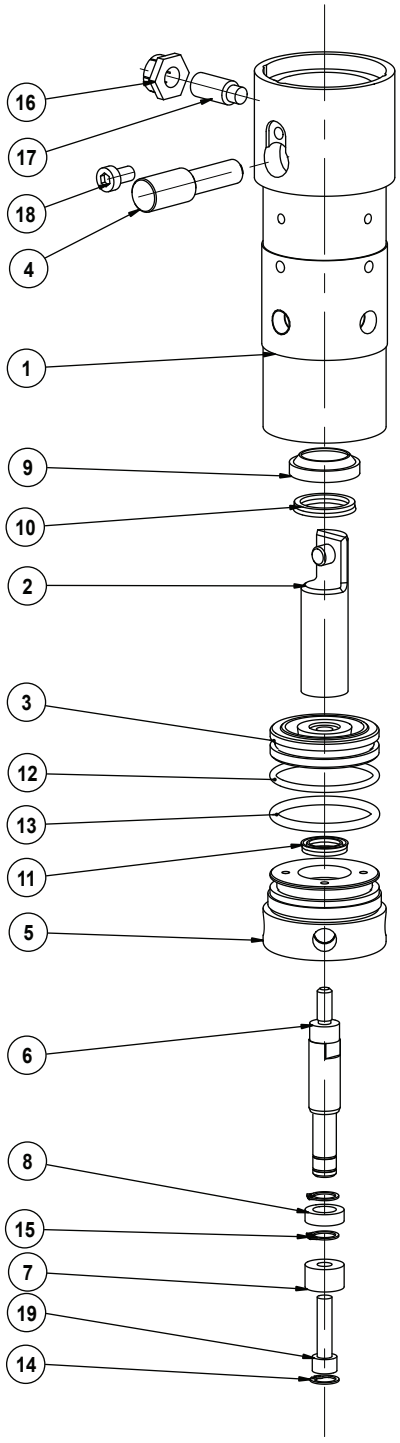
SFC63

Main Cyl. Assy	1	1	63mm CYL ASSY: 3/8 NPT OFF-CTR	PD200100A
		1	63mm CYL ASSY: 3/8 NPT ON-CTR	PD200100B
		1	63mm CYL ASSY: G1/4 OFF-CTR	PD200000A
		1	63mm CYL ASSY: G1/4 ON-CTR	PD200000B
29-18mm Hole Range	A	1	SFC 29-18mm FINGER	743702A
	B	1	SFC 29-18mm - DONUT	777502B
40-30mm Hole Range	A	1	SFC 40-30mm FINGER	752902A
	B	1	SFC 40-30mm - DONUT	791102A

PLC45 Cylinder Components

Det.	Qty	Description	BTM No.	SK
1	1	PLC45: BODY - G1/8 PORT	PD201101S	
	1	PLC45: BODY - 1/8 NPTF PORT	791601S	
2	1	PLC45 - PISTON ROD	791602S	
3	1	PG-45 - PISTON	728005A	
4	1	PLC45 ~ CAM PIN	791603S	
5	1	PLC45: END CAP - G1/8 PORT	PD201102S	
	1	PLC45: END CAP - 1/8 NPTF PORT	791804A	
6	1	PLC45- EXTENSION SENSING ROD	791805A	
7	1	PLC2/SFC2 - REAR FLAG	756406A	
8	1	PLC2/SFC2- FRONT FLAG	756405A	
9	1	WIPER RING - .75 ROD.	020284	*
10	1	PARKER U-CUP PACKING	020292	*
11	1	PARKER U-CUP PACKING	018085	*
12	1	O-RING	018774	*
13	1	O-RING	000271	*
14	1	INTERNAL RETAINING RING	013663	
15	2	EXTERNAL RETAINING RING	001238	
16	1	M10 FLEX-LOC NUT THIN HT.	018374	
17	1	M10 x 25 LG. DOG PT. S.S.	032474	
18	1	M6 x 10 LOW HD. S.C.S.	018777	
19	1	SHCS: M6X1.0 X 25 NYLON PATCH	019920	

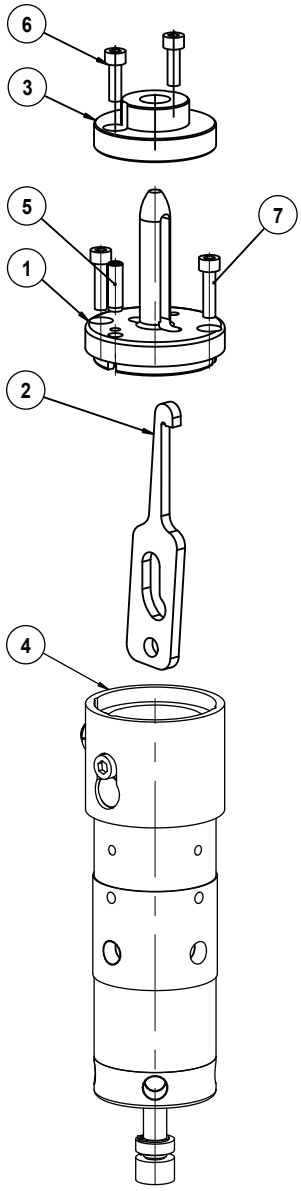
Seal Kit - BTM No. 034390
*includes all items marked **



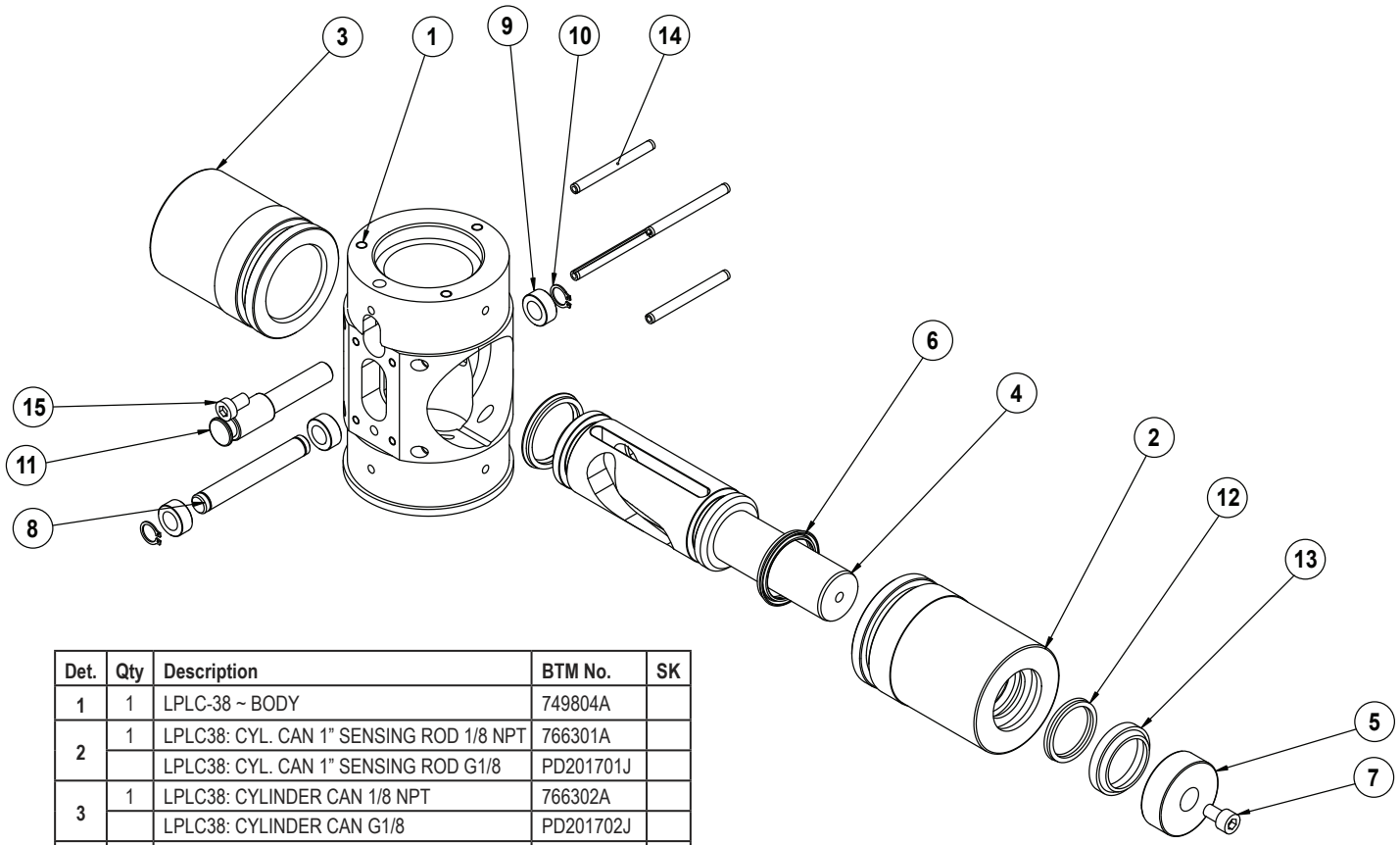
Main Assembly Components:

PLC45

	DET.	QTY	DESCRIPTION	BTM No.	Chrome Pin
13mm PIN DIA.	1	1	13.00mm DIA.PIN - 2 WAY	791601D	
		1	13.00mm DIA PIN - 4 WAY	791601C	
		1	13.00mm DIA. PIN - TAPERED	PD213201A	PD213201ACR
		1	12.80mm DIA. PIN - TAPERED	PD213201B	PD213201BCR
	2	1	FINGER	791602A	
	3	1	13.02 mm DONUT	791602C	
16mm PIN DIA.	1	1	16.00mm DIA.PIN - 2 WAY	791601K	
		1	16.00mm DIA PIN - 4 WAY	791601J	
		1	16.00mm DIA. PIN - TAPERED	PD213301A	PD213301ACR
		1	15.80mm DIA. PIN - TAPERED	PD213301B	PD213301BCR
	2	1	FINGER	791602A	
	3	1	16.02 mm DONUT	791602J	
	4	1	PLC45: CYLINDER SUB-ASSEMBLY - G1/8	PD201100S	
		1	PLC45: CYLINDER SUB-ASSEMBLY - 1/8 NPT	791600S	
	5	3	DOWEL: PULL M6 X 20	025534	
	6	2	SHCS: M5X0.8 X 16	015218	
	7	1	SHCS: M5X0.8 X 20	016046	



LPLC38 and LSFC38 Cylinder Components



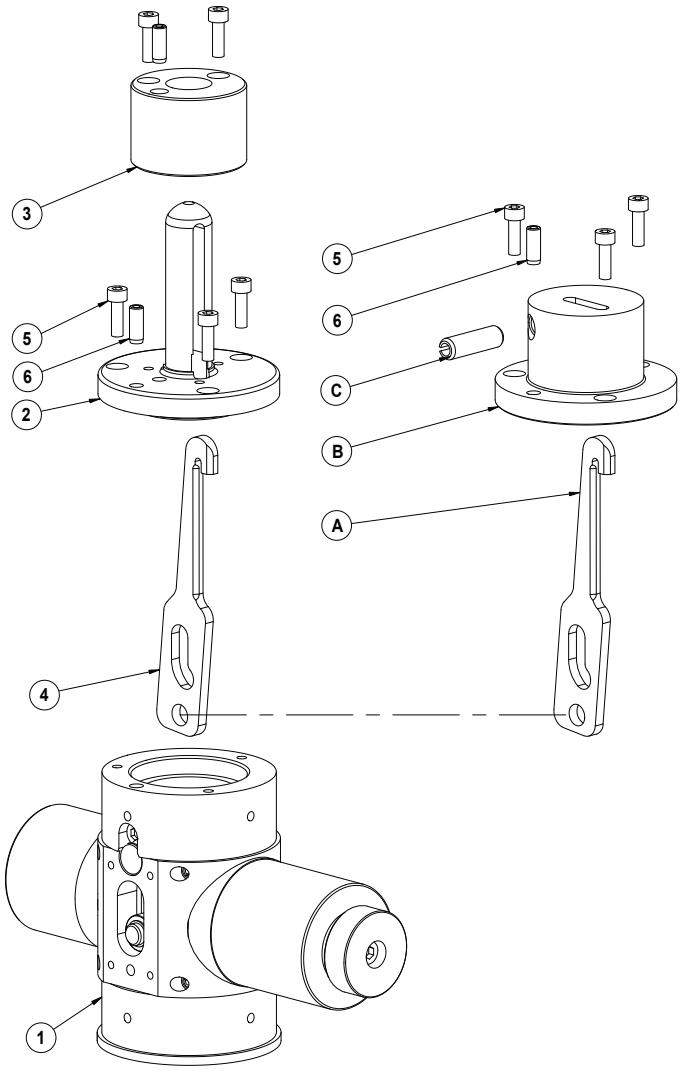
Det.	Qty	Description	BTM No.	SK
1	1	LPLC-38 ~ BODY	749804A	
2	1	LPLC38: CYL. CAN 1" SENSING ROD 1/8 NPT	766301A	
		LPLC38: CYL. CAN 1" SENSING ROD G1/8	PD201701J	
3	1	LPLC38: CYLINDER CAN 1/8 NPT	766302A	
		LPLC38: CYLINDER CAN G1/8	PD201702J	
4	1	LPLC38: PISTON	766303A	
5	1	LPLC38: UNLOCK ROD	766305A	
6	2	5/32 C/S E4 -U-CUP SEAL - 1.187	020333	*
7	1	SHCS: M6X1.0 X 10 NYLON PATCH	020503	
8	1	LPLC38: DRIVE PIN - PIN TO ROLLER	749805A	
9	3	PG38: INNER ROLLER A=.267	730204A	
10	2	EXTERNAL RETAINING RING	001238	
11	1	LPLC-38 CAM PIN	749803A	
12	1	PARKER U-CUP PACKING	018462	*
13	1	WIPER RING - 1.00 ROD.	020276	*
14	4	3/16 DIA. x 2" LG. ROLL PIN	013087	
15	1	M6 x 10 LOW HD. S.C.S.	018777	

Seal Kit - BTM No. 032303
*includes all items marked **

Main Assembly Components:

LPLC38

	DET.	QTY	DESCRIPTION	BTM No.	Chrome Pin
MAIN CYL. ASSY	1	1	LOCKING CYL. SUB-ASS'Y: G1/8	PD201700J	
		1	LOCKING CYL. SUB-ASS'Y: 1/8 NPT	PD201800J	
20mm PIN DIA.	2	1	20.00mm DIA. PIN - 2 WAY	PD200201B	
		1	20.00mm DIA. PIN - 4 WAY	PD200201A	
		1	20.00mm DIA. PIN - TAPERED SH	PD210601A	PD210601ACR
		1	19.80mm DIA. PIN - TAPERED SH	PD210601B	PD210601BCR
	3	1	20.00mm DONUT	743706A	
	4	1	20mm FINGER	PD201701A	
		1	20mm FINGER TAPERED	PD211101A	
25mm PIN DIA.	2	1	25.00mm DIA. PIN - 2 WAY	791301B	
		1	25.00mm DIA. PIN - 4 WAY	777501A	
		1	25.00mm DIA. PIN - TAPERED FL	PD210701A	PD210701ACR
		1	24.80mm DIA. PIN - TAPERED FL	PD210701B	PD210701BCR
		1	25.00mm DIA. PIN - TAPERED SH	PD210702A	PD210702ACR
		1	24.80mm DIA. PIN - TAPERED SH	PD210702B	PD210702BCR
	3	1	25.00mm DONUT	777502A	
	4	1	25mm FINGER	773401A	
30mm PIN DIA.	2	1	30.00mm DIA. PIN - TAPERED FL	PD210801A	PD210801ACR
		1	29.80mm DIA. PIN - TAPERED FL	PD210801B	PD210801BCR
		1	30.00mm DIA. PIN - TAPERED SH	PD210803A	PD210803ACR
		1	29.80mm DIA. PIN - TAPERED SH	PD210802B	PD210802BCR
	3	1	30.00mm DONUT	034149	
	4	1	30mm FINGER TAPERED	PD211301A	
35mm PIN DIA.	2	1	35.00mm DIA. PIN - 2 WAY	791001A	
		1	35.00mm DIA. PIN - 4 WAY	773501E	
		1	35.00mm DIA. PIN - TAPERED SH	PD210901A	PD210901ACR
		1	34.80mm DIA. PIN - TAPERED SH	PD210901B	PD210901BCR
	3	1	35.00mm DONUT	791201C	
	4	1	35mm FINGER	773102C	
		1	35mm FINGER TAPERED	PD211401A	
40mm PIN DIA.	2	1	40.00mm DIA. PIN - 2 WAY	PD200801B	
		1	40.00mm DIA. PIN - 4 WAY	753301B	
		1	40.00mm DIA. PIN - TAPERED FL	PD211001A	PD211001ACR
		1	39.80mm DIA. PIN - TAPERED FL	PD211001B	PD211001BCR
		1	40.00mm DIA. PIN - TAPERED SH	PD211002A	PD211002ACR
		1	39.80mm DIA. PIN - TAPERED SH	PD211002B	PD211002BCR
	3	1	40.00mm DONUT	753103A	
	4	1	40mm FINGER	PD201701G	
	5	5	SHCS: M5X0.8 X 16	015218	
	6	2	DOWEL: PULL M6 X 16	018992	



LSFC38

Main Cyl. Assy	1	1	38mm CYL ASSY: G1/8 NPT	PD201700J
		1	38mm CYL ASSY: 1/8 NPT	PD201800J
29-18mm Hole Range	A	1	29-18mm CLAMP FINGER	PD201701A
	B	1	29-18mm - DONUT CAP	PD202401A
40-30mm Hole Range	A	1	40-30mm CLAMP FINGER	PD202402B
	B	1	40-30 mm - DONUT CAP	PD202401B

CYLINDER SEAL REPLACEMENT

After extended service, it may be necessary to replace the clamp seals. Seal kits are available from BTM (See Cylinder Components breakdown for your specific cylinder). To replace the seals, follow the procedure outlined below.

63MM CYLINDER

DISASSEMBLY: Disassemble the Pin, Rest block (donut), and Finger (Refer to pp 16-18). Remove the rear switch package (Refer to p. 12).

Remove the rear adjustable flag
(5mm allen wrench required).

Next, remove the two external retaining rings that retain the front stationary flag and remove flag.

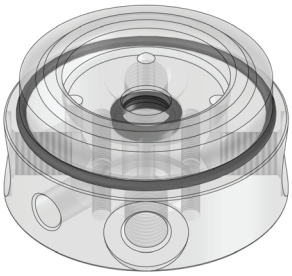
Remove the end cap
(Spanner wrench is required).

The piston rod and piston assembly can now be withdrawn from the back of the clamp cylinder. Remove old seals and discard. Clean all components thoroughly.

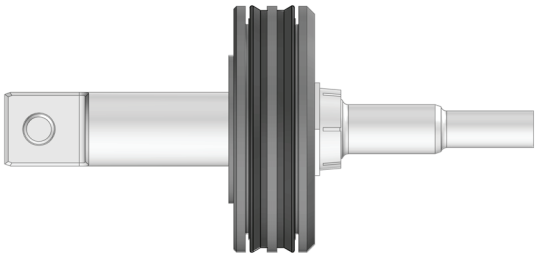
RE-ASSEMBLY:

The wiper seal is inserted in the clamp body with the lead wiper edge facing the pin end (top) of the clamp body.

The rod seal in the body is inserted in the clamp body with the sealing edge facing the cylinder bore.



The rod seal inserted in the end cap with the sealing edge facing facing the cylinder bore. The end cap o-ring is installed at the base of the threads on the end cap.

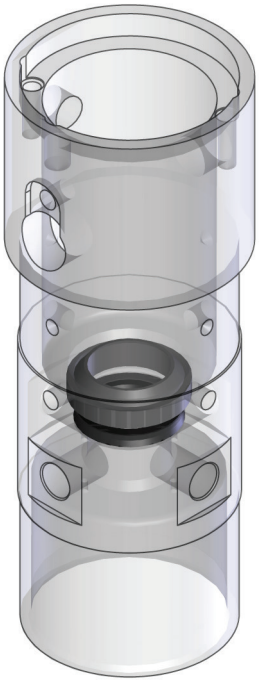


The piston seals are installed with the sealing edges facing away from each other. Grease the piston rod-piston with extreme pressure rated grease (Amoco Rykotac EP or equivalent) and insert it into the cylinder.

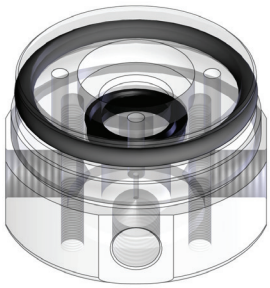
Thread on the end cap and install the front stationary sensing flag and retaining clips. Reinstall the rear adjustable sensing flag and the sqitch package. Reinstall the clamp finger, locating pin, and rest block (donut).

45MM CYLINDER

The process for changing the seals in the 45mm cylinder is essentially the same as in the 63mm cylinder. The only difference is that the 45mm piston uses (1) o-ring on the piston.



CYLINDER BODY SEALS



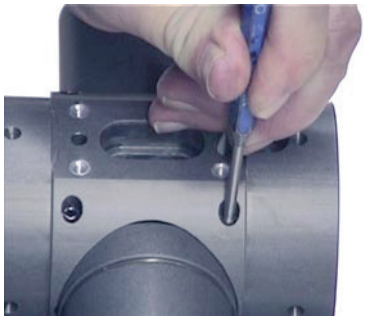
END CAP SEALS

PISTON SEAL

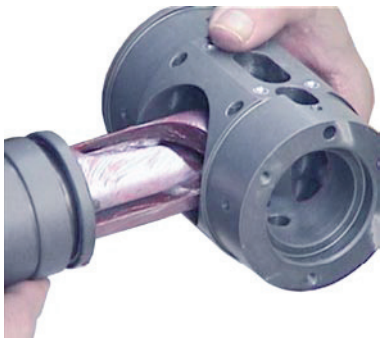
38MM LOCKING CYLINDER

DISASSEMBLY: Disassemble the Pin, Rest block (donut), and Finger (Refer to pp 20-22). Make sure that all of the rollers are removed from the clamp. Remove the switch package and cover plate (Refer to p 20)

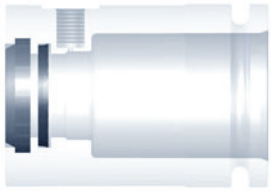
Remove the screw retaining the unlock rod, and remove the rod (5mm allen wrench required).



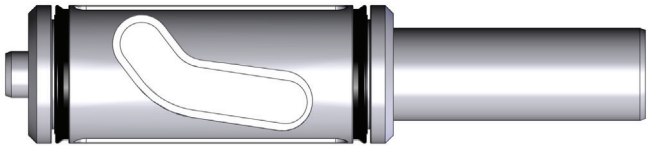
Push out the (2) roll pins which retain the cylinder can with the open end. (A 3/16 diameter punch is required)



Remove the cylinder can and the piston. Remove old seals and discard. Clean all components thoroughly.



The wiper seal is inserted into the cylinder can with the lead wiper edge facing the small opening of the can. The rod seal in the cylinder can is inserted with the sealing edge facing the large opening of the can.



The piston seals are installed with the sealing edges facing away from each other. Grease the piston rod-piston with extreme pressure rated grease (Amoco Rykotac EP or equivalent).

Insert the piston rod into the cylinder can, and through the seals.

Reinstall the cylinder can and piston assembly. Replace the (2) roll pins which retain the cylinder can. Replace the unlock rod. Assemble the finger, pin, and rest block (donut). Install the switch package.

Warranty Information:

BTM Corporation warranties its Pin and Finger Clamps against defects in material and workmanship for one (1) million cycles or a period of three (3) years after the ship date from BTM, which ever comes first.

This warranty is limited to replacing or repairing at BTM's option, F.O.B. BTM's factory, any part found by BTM to be defective in materials and/or workmanship. Any application of a BTM product outside the intended use of the product shall not be warranted by BTM Corporation. Furthermore, BTM will not be liable for any expenses incurred for repairs or replacement made outside BTM's facilities without written consent (or damages arising out of such replacements or repairs). Under no circumstances will BTM be held responsible for any consequential damages.

The warranty is limited to the repair or replacement of the defective part(s) and does not include installation.

This warranty is the only warranty extended by the seller in connection with any sale made hereunder and is in lieu of all other warranties, express, implied or statutory including warranties of merchantability and fitness for purpose.

Potential Failure Mode and Effects Analysis Machinery FMEA

Potential Failure Mode and Effects Analysis
Machinery FMEA

Part Number: 756400A **Customer: BTM Standards** **Prepared By: Brian Petit**

Part Description: PLC2 ~ Pin Locator Clamp **B/P Date/Lev: 11/8/99 Updated 5/11/01 B** **Approved By: Engineering**

P#	Subsystem Name/Function & Performance Requirements	Potential Failure Mode	Potential Effect(s) of Failure	SEV	t	Potential Cause(s) of Failure	OCC	Current Design & Machinery Controls	DET	RPN	Recommended Corrective Action(s)	Person Responsible Comp. Date	Action(s) Taken	SEV	OCC	DET	RPN
1	**BTM Corp.** Pin Locator Clamp 300 lbs clamping force at 80 psi. **Function** Positively locate and retain materials into fabrication systems **MCBF** 3,000,000 if designed air pressures are maintained	Fracture of clamp finger	Loss of primary function	8		1a. Clamp subjected to excessive air pressure >90psi **MTTR** 15min replace PLC unit	3	ES testing with Air pressure maintained at 60-90psi	4	96	Air pressure regulators maintaining 60-90psi in the plant scheduled maintenance	Local Plant			2	2	32
				8		2a. Clamp subject to excessive external load **MTTR** 15min replace PLC unit	3	Sensing of Prox. Target in opened & close position	4	96	Review part mass and external interference's	Local Plant			2	4	64
2	**BTM Corp.** Pin Locator Clamp 300 lbs clamping force at 80 psi. **Function** Positively locate and retain materials into fabrication systems **MCBF** 3,000,000 if designed air pressures are maintained	Reduction or loss of clamp force	Loss of primary function	8		2a. Loss of air pressure **MTTR** N. A.	2	ES testing with Air pressure maintained at 60-90psi	2	32	No action at this time						
3	**BTM Corp.** Pin Locator Clamp 300 lbs clamping force at 80 psi. **Function** Positively locate and retain materials into fabrication systems **MCBF** 3,000,000 if designed air pressures are maintained	Loss of locational repeatability to N/C surface	Production quality reduced	6		3a. Improper torque of mounting screws **MTTR** 15min replace PLC unit	3	ES testing at torque specifications	3	54	Torque mounting screws at installation of Pin Locator Clamp	Local Plant			2	3	36
				6		3b. Mounting inadvertently hit or moved **MTTR** 15min replace PLC mount	3	Plant supplies guarding for mount	2	36	No action at this time						
4	**BTM Corp.** Pin Locator Clamp 300 lbs clamping force at 80 psi. **Function** Positively locate and retain materials into fabrication systems **MCBF** 3,000,000 if designed air pressures are maintained	Clamp will not cycle	Loss of primary function	8		4a. Loss of proximity signal **MTTR** 15min replace PLC unit	4	Cycle tested at assembly	3	96	Adjust close position sensing target to material thickness	Local plant			2	2	32
				8		4b. Contaminated air system **MTTR** N. A.	3	Carboxilated Nitrile seals ES testing 20% Electrolytic Iron Powder and 80% zinc metal powder to simulate plant condition w/ water Introduced	3	72	Add air filter in air supply line Plant scheduled maintenance	Local Plant			2	2	32

Potential Failure Mode and Effects Analysis
Machinery FMEA

Part Number: 756400A **Customer: BTM Standards** **Prepared By: Brian Petit**

Part Description: PLC2 ~ Pin Locator Clamp **B/P Date/Lev: 11/8/99 Updated 5/11/01 B** **Approved By: Engineering**

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4	**BTM Corp.** Pin Locator Clamp 300 lbs clamping force at 80 psi. **Function** Positively locate and retain materials into fabrication systems **MCBF** 3,000,000 if designed air pressures are maintained	Clamp will not cycle	Loss of primary function	8		4c. Heavy weld slag build up on clamp **MTTR** 15min replace PLC unit	4	Minimal slot clearances & wiper seal ES testing 20% Electrolytic Iron Powder and 80% zinc metal powder to simulate plant condition	3	96	Add weld slag guard	Local Plant			2	3	48
				8		4d. Corrosion or water Accumulating in upper finger cavity **MTTR** 15min replace PLC unit	5	Black oxide components, wiper seal & flash chrome piston rod.	4	160	Flash Chrome cam pin & Add drain hole in body cavity	BTM Corp. Brian Petit 5/11/01	Flash chrome added to cam pin detail. Ref. EC100159 Added drain hole in body detail. Ref. EC100173		2	3	48

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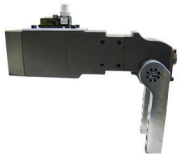

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BTM's Gripper line ranges from compact light duty models to locking & non-locking heavy duty models.

PIN PRODUCTS

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BTM's Precision Part Locators are used whenever your production needs require locating precise holes in a workpiece.

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BTMs' Pin Locator Clamps and Single Finger clamps are used in stationary part nests, welding fixtures, transfer systems, robot end effectors and numerous other clamping applications. These clamps locate and hold the work while other operations are performed.

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